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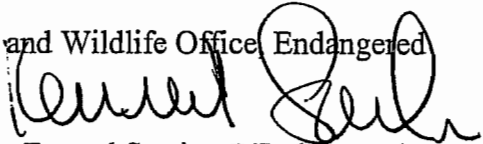


In reply refer to  
1-1-04-I-2958

22 November 2004

**Memorandum**

**To:** Chief, Resources Management Division, Bureau of Reclamation, South-Central California Area Office

**From:** Assistant Field Supervisor, Sacramento Fish and Wildlife Office, Endangered Species Division, Sacramento, California 

**Subject:** Request for Additional Information to Initiate Formal Section 7 Endangered Species Act (ESA) Consultation on Execution of Long-Term Water Service Contract Renewals between the United States and Eight Water Service Contractors of the Central Valley Project's San Luis Unit

This memorandum is in response to your September 14, 2004, memorandum, requesting initiation of formal consultation, pursuant to section 7(a) of the Endangered Species Act of 1973 (ESA), as amended (Act), on behalf of the Bureau of Reclamation (Reclamation) and eight Central Valley Project (CVP) co applicants: the California Department of Fish and Game, the cities of Avenal, Coalinga and Huron, Pacheco Water District, Panoche Water District, San Luis Water District, and Westlands Water District (Contractors). We received your memorandum on September 15, 2004. We provided a draft copy of this memo to Joe Thompson of your staff on October 13, 2004. We further discussed our concerns and information needs with you on a conference call on November 3, 2004. During that conference call, you requested that we finalize this memo.

Your Biological Assessment (BA) for Long-Term Water Service Contract Renewal of San Luis Unit (SLU) Contracts, dated September 14, 2004, concludes that the proposed action is not likely to adversely affect listed plants or wildlife, and would not result in changes to or alterations of habitat used by listed species either known to occur or with the potential to occur in the SLU service area. The BA bases this determination on the assumption that the environmental baseline for listed and proposed species and designated critical habitat potentially occurring within the action area would not change with the implementation of the

proposed action of renewing the long-term water service and repayment contracts between Reclamation and the eight SLU contractors (page 95 of BA).

The Service has not received all of the information necessary to initiate formal consultation on this project as outlined in the regulations governing interagency consultations (50 CFR §402.14). The BA provides a description of the proposed action and an analysis of effects (separated out by Federal agency or local/private entity). However, the Service believes that the BA inadequately describes: the specific area that may be affected by the action, the manner in which the action may affect any listed species or critical habitat, the effects of related actions, and any cumulative effects. We are therefore not initiating consultation on this project until such a time as the information requested below is provided. Based on the information provided in your BA and in our files, we believe the proposed action has the potential to adversely affect listed species and their critical habitat as described in Table 6 of the BA, and attached to this memo and request that Reclamation provide the additional information requested to initiate formal consultation on this project. In addition to the species included in Table 6, we believe that water deliveries to SLU contractors may also affect groundwater and surface water quality outside of the SLU which could affect delta smelt downstream in the San Joaquin River and Delta.

## **Information Needs**

### Description of the Proposed Federal Action

As stated in the BA, "The proposed action is long-term water service contract renewals that will provide for the continued delivery of up to the same quantities of CVP water contract amounts to the same lands currently covered under the existing long-term water service contracts." We do not believe this comports with Reclamation's July 19, 2004 memorandum on CVP long-term contract renewal consultation parameters. In the July 19 memorandum, Reclamation stated that it is "requesting consultation on delivery of the full contractual entitlement of each CVP water service contractor". The memorandum further specifically distinguishes a difference between consultation on contractual entitlements (which we understand to include all contract assignments, in addition to the long-term contract), and the variable amounts that Reclamation is likely to actually deliver from one year to the next, and states that it wishes the long term contract renewal consultations to address the Federal entitlement rather than historical deliveries.

To the extent that the effects analysis in the BA is premised on effects of historic water deliveries rather than on effects of delivery of full contractual entitlements, the effects analysis in the BA is flawed and must be revised to reflect the effects of the proposed federal action. As an aside, Reclamation's contention in the BA that the next 25 to 40 years of water deliveries are likely to be the same as the past 25 years is also flawed in our view because it ignores programs, such as CalFed, with explicit goals to increase both the amount and reliability of Federal and State water deliveries, numerous projects in various states of

feasibility evaluation to carry out these goals, and actual proposed projects, such as the South Delta Improvement Project, designed primarily for this purpose. It also implicitly assumes that there will be no more opportunities for water conservation technologies to advance water use efficiencies that will help make the same amount of water usable by more people or more acres of crops.

**Information Need #1:** Reclamation needs to rectify the discrepancy in the proposed Federal action between the BA and the July 19, 2004 memorandum, and provide an effects analysis commensurate with the project description.

#### Contract Service Area Discrepancies

There is significant discrepancy between the acreages of the Contract Service Areas depicted in Table 1 of the BA and Attachment C of the BA. Below is a Table which highlights those acreage discrepancies:

Contractor	Contract Quantity	Contract Type	Area (acres) From Table 1	Area (acres) From Attchmt C
City of Avenal	3,500 afy	M&I	13,120	46,347
City of Coalinga	10,000 afy	M&I	5,248	106,618
City of Huron	3,000 afy	M&I	994	771
Pacheco WD	10,080 afy	Ag	10,080	4,531
Panoche WD	94,000 afy	Ag	39,936	39,952
San Luis WD	125,080 afy	Ag/M&I	66,458	66,267
Westlands WD	1,150,000 afy	Ag	605,422	605,555

Page 28 of the BA notes that, "The San Luis Unit action area includes the water service areas of the eight San Luis Unit contractors as shown in Figure 1. Note that Figure 1 boundaries coincide with boundaries of Districts depicted in Attachment C to the BA, not the area depicted in Table 1.

**Information Need # 2:** Reclamation needs to reconcile the acreages of the contract service area boundaries and provide the maps of service areas that are actually attached to each of the SLU contracts. We realize that Reclamation has provided our office with GIS coverage of water district boundaries; however, we have discovered discrepancies between these maps and maps attached to the contracts in other CVP Divisions. For this reason, we would like to see the maps of water district boundaries that Reclamation will attach to the contract.

#### Is Providing CVP Water to Expansion Lands Part of the Proposed Federal Action?

The State Water Resources Control Board (SWRCB) issued a Final EIR for the CVP Consolidated and Conformed Place of Use (CPOU) and a Revised Water Right Decision 1641, dated March 15, 2000 (part of which pertained to the Petition to Change and

Consolidate Places of Use and Purposes of Use of Water Under Certain Permits of the CVP). The SWRCB opted not to amend Reclamation's permit to include expansion lands with the CVP districts (lands within CVP districts not having received CVP water and outside the State permitted place of Use). See following language from Decision 1641: "Accordingly, the expansion areas cannot be added to the CVP place of use at this time. Expansion areas can be added on a case-by-case basis in the future, subject to appropriate CEQA documentation and the approval of the SWRCB under Water Code section 1700, et seq., or other provisions of the Water Code." Further the Final EIR for CPOU noted regarding expansion lands, "Potential impacts in expansion areas were discussed at a programmatic level because future land and water uses cannot be determined at this time. **Mitigation will be developed as part of the site-specific environmental documents to be written for the renewal of CVP water service contracts.**"- *emphasis added*. Expansion lands identified in the Final EIR for CPOU within the SLU were as follows:

City of Coalinga: 98,289 acres;

City of Avenal: 30,257 acres (includes 232 acres of habitat that overlap with Westlands

Water District: Westlands Water District: 9,417 acres.

A cursory comparison of the maps in the CPOU Final EIR with the BA (Attachment C) and BA Figure 1 shows that the expansion areas are indeed included in the maps provided of the service area boundaries. Because expansion lands are not currently within the CVP POU, we are uncertain as to Reclamation's intent for including them in maps of water district service areas for this consultation. Does Reclamation anticipate federal water deliveries to these lands, or is Reclamation defining the action area to include expansion lands because commingled water supplies enable a larger area to be irrigated, including areas adjacent to but outside of the CVP POU, although CVP water is not technically delivered to those areas? The delivery of supplemental Federal water expands the extent, duration, or intensity of activities that take place not just within the actual CVP POU, but also within the entire water district that uses Federal water as part of its water supply. In our view this extends the effects of Federal water deliveries outside of the actual CVP POU to adjacent lands, such as expansion lands, that are within the water district and which would not be irrigated or developed to the same extent, duration, or intensity absent the supplemental Federal water supply.

The BA does include goals and objectives of local land use planning documents (e.g., general plans for cities/counties). However, most of these planning documents are significantly dated, and do not provide the mechanisms to ensure that listed species habitats are protected. The BA does not discuss habitat types present within water districts or on expansion lands or the conservation value of these areas for federally listed species, nor does it discuss measures that will minimize the effect of land use changes anticipated over the life of these contracts within water districts or on expansion lands.

**Information Need #3:** Reclamation needs to clarify the reason that expansion lands have been included in maps of water district service areas and the relationship of these lands to the proposed federal action. It is unclear how the BA for this project addresses impacts of future land and water uses within the expansion areas since no conservation measures are described in the BA for effects associated with 25 to 40 years of water deliveries to these lands. We ask Reclamation to specifically identify mitigation measures that will satisfy SWRCB requirements highlighted in D-1641 and the CPOU EIR and that adequately address listed species habitat losses in the expansion areas. We further request any documentation that shows that the SWRCB has allowed these expansion lands to be included as part of the CPOU.

#### Mitigation for Encroachment Lands

The Final EIR for CPOU (SWRCB November 1999) identified and analyzed impacts associated with CVP deliveries to encroachment lands (lands within the boundaries of CVP water contractor service areas that have already received CVP water but are located outside the authorized CVP Place of Use). Of the 45,390 acres of encroachment lands that served CVP water for agricultural purposes, the following encroachment was identified in the SLU:

<u>San Luis WD</u>	789 acres of alkali scrub 7,847 acres of annual grassland 2,032 acres of valley-foothill riparian/fresh emergent wetland
<u>Westlands WD</u>	1,611 acres of valley-foothill riparian/fresh emergent wetland 6,653 acres of annual grassland 22,343 acres of alkali scrub

The Final EIR for CPOU (from page 2-91, Section 2.4.2.4 Integration of Encroachment Land Mitigation Needs Into Ongoing Reclamation Programs) stated that, "Reclamation shall be required to develop a schedule for feasible implementation and monitoring of mitigation or restoration actions subject to approval of the SWRCB. In addition, the SWRCB will also compare each mitigation or restoration project's environmental/habitat benefits with a set of criteria to be developed jointly by Reclamation and the U.S. Fish and Wildlife Service, that will assign environmental/habitat target values that need to be restored or mitigated for, pursuant to the approval of the petition to change the POU focusing primarily on listed species habitats lost on encroachment lands as identified in Table 2-36 found on page 2-79."

The Final EIR for CPOU also identified encroachment lands that served CVP water for municipal or industrial purposes. On page ES-2 of the Final EIR for CPOU it is noted that, "Encroached lands that are served CVP water for municipal or industrial purposes are not analyzed in detail because projects associated with these land uses have already been evaluated in previously prepared CEQA documents by other local land management

agencies.” Encroachment lands that served CVP water for municipal or industrial purposes in the SLU were identified in the Final EIR for CPOU as follows:

<u>City of Avenal</u>	2,207 acres of annual grassland
	273 acres of valley-foothill riparian/fresh emergent wetland

**Information Need #4:** The Service is unaware of the progress of mitigation for encroachment lands associated with CVP water deliveries as required from the Final EIR for CPOU and D-1641 of the SWRCB. No mitigation measures for CPOU encroachment lands were provided with the BA or its attachments to assist us with evaluating the environmental baseline for listed species in the SLU. Such mitigation measures, specific to the affected habitats related to SLU CVP deliveries should be provided in the initiation materials provided for this formal consultation. Further, information on any CEQA documents related to encroachment of lands in the SLU for municipal or industrial purposes needs to be incorporated into the baseline of the BA for this consultation.

Contract Provision: Drainage Service- Insufficient Information on Drainage Plan

As described in Table 3 on page 17 of the BA, “For specified contractors, drainage service shall be provided when it becomes available at rates established in then-existing rate-setting policy for irrigation water .” Table 11 of the BA provides a breakdown of Contract Provisions and a summary Effects Analysis. For Drainage Service – Contractor-Specific Provision (Page 81), the BA makes the following determination, “Continues authorization of specified contractors to receive drainage service pursuant to San Luis Act; actual drainage service will not become available until completion of separate EIS and appropriate consultation; ...failure to require drainage service via San Luis Drain could be a positive effect on listed species but because any such service has not been provided, such effect is not properly analyzed through these documents.” Procedurally, this effects determination is problematic and inconsistent with the proposed action: ESA review of execution of long term contracts for the SLU.

Page 73 of the BA specifically identifies what is requested from this ESA consultation,”... the task here is to assess whether any changes to the legal relationship between Reclamation and the SLU contractors that result from the contract renewal would result in changes to the physical environment that may affect a listed species or its critical habitat.” We strongly disagree with this overly narrow characterization of the scope of analysis for this consultation. The scope of this consultation as we understand it is the effects of delivery of the full Federal water entitlement for 25 years (or 40 years for M&I only contracts), starting from the date upon which Reclamation signs new contracts. CVP water applied to some lands within the SLU results in contaminated irrigation drainage, not all of which is captured in existing facilities. To the extent that the BA does not describe the effects of this contaminated irrigation drainage on listed species, from the point of application through its

entry into subsurface drainage and wherever it goes from there, then the effects analysis in the BA fails to address the effects of the Federal action.

Future implementation of a drainage plan for the SLU likely will include implementation of a suite of management options, including various forms of treatment, reuse areas, and evaporation ponds. All of these options would result in changes to the physical environment, and some of these land use changes may affect listed species. The Service is tasked with completing a consultation on the execution of long term contracts for the SLU, some of which include the provision that Reclamation will implement drainage service. A long term plan for such drainage service has not yet been completed or subject to public review and feasibility analysis. Effects of drainage service are a direct effect of long term water deliveries to SLU districts that have a drainage problem. Therefore, the Service does not have sufficient information to analyze the full effect of execution of long term contracts, for those contractors that include the provision of drainage service.

**Information Need # 5:** If Reclamation wishes to renew long term contracts for the SLU prior to proposing or establishing a drainage plan, then Reclamation needs to describe the effects of drainage resulting from the lack of drainage service. Absent a proposal from Reclamation, we would assume for the purposes of such a consultation that the status quo would exist through the term of the contract. Since drainage is an effect of use of CVP water, we would expect Reclamation to reinitiate consultation on the SLU contracts when a drainage plan has been formulated. Alternatively, the SLU long term contracts may not be ripe for consultation because of unresolved issues related to drainage. Reclamation should consider informally consulting with the Service on the effects of long term contract renewal in the context of alternatives it is considering for drainage service. Reclamation could then provide the Service with all information and associated effects related to a completed drainage plan to be implemented for those SLU Contractors that have contracts that include provision of drainage service. Such a plan for drainage service is expected to be submitted for ESA consultation sometime in early 2005.

Contract Provision: Drainage Service-Pacheco WD

Page 55 of the BA identifies Panoche, San Luis, and Westland's Water Districts as being entitled to receive drainage service under the terms of their existing contracts (page 55 of BA). However, the San Luis Drainage Feature Re-evaluation is including drainage service for Pacheco WD as well. It is unclear whether the long term water service contract for Pacheco WD would include a provision for drainage service.

**Information Need # 6:** The Service requests that draft contracts for all SLU Contractors be provided to the Service for this formal consultation so that we may review all of the provisions that may influence the nature, scope, and duration of effects to listed species when contracts are executed.



Contract Provision: Drainage Service - Effects

Page 28 of the BA notes: "...CVP water put to beneficial use in the San Luis Unit action area could not reasonably be expected to affect fishery resources outside the action area." Also on Page 56, Westlands WD and the balance of the San Luis WD "do not have systems that discharge subsurface drainage outside their boundaries." Although this factually correct, it is misleading in that there is a proportion of this agricultural drainage that does leave the district(s) by means of subsurface flow (as was described for Broadview Water District in the January 2004 EIR for the Broadview Water Contract Assignment Project, SCH. No. 2003092098, prepared for Pajaro Valley Water Management Agency by Environmental Science Associates). As noted on page 54 of the BA, the Central California Irrigation District (CCID) and Firebaugh Canal Water District (FCWD) resumed litigation against Department of Interior (DOI), which stipulates that Reclamation is utilizing an "informal, in-valley drainage disposal system" that disposes of drainage via subsurface flow from Westlands and causes nuisance and trespass to CCID and FCWD (Third Amended complaint and Demand for Jury Trial, Filed February 10, 2003, CIV-F-88-634-OWW).

Sumps and check drains may discharge some of SLU drainage into the Delta Mendota Canal (as stipulated in the civil case between CCID and FCWD against DOI cited above). The BA on page 60 noted that Reclamation data indicate that the concentration of selenium in water delivered to the Mendota Pool has met the 2 ug/L monthly mean objective in Mendota Pool since July 2002. However, Reclamation data also identify that of the added load of selenium (added to the Delta Mendota Canal from O'Neil Forebay to Mendota Pool) about half is from the Delta Mendota Canal Sumps and the other half is from unidentified sources (e.g. leakage from cracks, contributions from Delta Mendota Canal check drains along the upslope side of the canal). Annual exceedences of selenium objectives in the Grasslands wetland supply channels are an ongoing concern to the Service. Impounded wetland systems like those on refuges are very susceptible to adverse effects from moderately elevated concentrations of selenium in their water supply, and listed species that depend on these wetlands, such as giant garter snake, are vulnerable to sub-lethal effects of contamination.

**Information Need #7:** The BA should discuss all effects associated with seleniferous agricultural drainage created within the SLU that is either discharged via surface means or leaves the SLU districts by means of subsurface flows. Such effects include discharges into the Delta Mendota Canal both from the sumps and the unregulated check drains.

Contract Provision: Drainage Service – Sources of Selenium Study

Page 61 of the BA includes a description of the "Sources of Selenium Study." Because the results of this study are relevant to several ongoing and future consultations (e.g., SLU and Delta Mendota Canal Long Term Contract Renewals, South Central California Area Office Operations and Maintenance and San Luis Drainage Feature Re-evaluation consultations) the Service is requesting a copy of this report, even if it still remains in draft form.



**Information Need #8:** The Service would like to be provided with any reports pertaining to the following study: U.S. Geological Survey, March 2004. Estimation of a Water Budget of 1972-2000 for the Grasslands Area, Central Part of the Western San Joaquin Valley, California. Draft report prepared for Reclamation.

Reliability of CVP Contract Deliveries to SLU (e.g., quantity of water delivered to the contractor)

The BA is inconsistent in its description of the reliability of water delivered to the SLU. As an example the BA on page 27 notes, "During the term of the contract, it is expected that the yield of the CVP will increase to better meet the competing demands for CVP water." Further, the BA on page 31 stipulates, "...lands would be brought back into production as "drainage service is provided and the Westlands Water District's water supply increases." This is contradicted however, by the BA on page 85 which notes, "Depending on the effects of other contract provisions, the amount of CVP water used by irrigation and M&I users may decrease as a result of the renewed contracts..." We also note that the statement on page 27 anticipates effects of a future action that Reclamation has not yet proposed and, as such, is inconsistent with the federal action for which Reclamation is requesting consultation.

Although the contract total for each SLU contractor would not change (BA page 74) it is incorrect to assume that, "...there would be no change from the contract water supply in the existing [SLU] contracts." The issue of reliability of contract supply is a complicated issue, being influenced by numerous factors, including water year type, M&I demands, pumping constraints in the Delta as defined by SWRCB D-1641, operational constraints to protect federally listed fish, carryover storage, increased pumping in the Delta (as part of South Delta Improvement Project (SDIP)), exchange agreements, State Water Project/CVP intertie, changes in San Luis Reservoir low point, Reclamation's M&I shortage policy, assignments/transfers/exchanges, etc. Reclamation did however, for the purposes of their Operations Criteria and Plan (OCAP) consultation assume a % reliability of contract deliveries south of Delta. The information in the BA for this project should be consistent with assumptions in reliability projected in the OCAP BA.

**Information Need #9:** Reclamation needs to revise the BA to ensure consistency on discussions of reliability. Further, Reclamation will ensure that the information in the BA for this project is consistent with reliability of water deliveries to south of Delta contractors projected in the OCAP BA. Reclamation also needs to describe the water assignments that have been approved since the execution of the current contracts, and which it is proposing to approve, and the effects of delivery of these full contract amounts, in accordance with Reclamation's July 19, 2004 memorandum on consultation parameters for the long term water service contract consultations.

Reliability of CVP Contract Deliveries to SLU – Recent Historic Average Deliveries

As noted on page 74 of the BA, “As a result of the federal action, the San Luis Unit contractors would continue to receive CVP water supplied in quantities **that do not exceed contract amounts...**” *emphasis added*. The recent historic average deliveries, which most accurately depict the on the ground effects of CVP water deliveries in the SLU, are significantly lower than the full contract amounts which are the subject of this consultation.

It would be helpful to know what the actual breakdown of water supply was for each district (e.g. CVP deliveries, State Water Project (SWP) deliveries (if any), groundwater, transfers, exchanges, and other types of agreements (reallocation agreement with Santa Clara Valley WD and Delta Mendota Water Users Authority, and forbearance agreements). What has been assumed in other analyses (e.g., OCAP) for future deliveries to the SLU (60%? 70%? etc.). How would such improvements in water quantities delivered to the districts result in changes to land use (e.g., the acreage of irrigated agriculture)?

**Information Need #10:** In order to adequately assess effects, including cumulative effects and the effects of interrelated or interdependent actions, Reclamation should provide information in the BA on land use changes that are anticipated with full contract deliveries (e.g., changes in irrigated acreage, urban development, etc.). Further, Reclamation shall provide an actual breakdown of recent historic water supplies for each SLU contractors (e.g., CVP deliveries, SWP deliveries (if any), groundwater, transfers, exchanges, and other types of agreements (reallocation agreement with Santa Clara and Delta Mendota Canal Authority, and forbearance agreements).

Water Assignments to SLU Contractors

Water Assignments already executed or reasonably expected to be executed during the life of these long term water contracts were not included in the contract total for SLU contractors. Page 71 notes that in 2002, “Mercy Springs Water District assignment up to 4,198 acre-feet per year, a portion of their entitlement to Westlands Water district No. 2. An Environmental Assessment was prepared by Reclamation in September 2000 and the assignment is not further analyzed in this document.” Since this assignment has been completed and executed, why then is it not included in the full contract quantity for Westlands and analyzed in this BA? Our understanding of Reclamation’s July 19, 2004 memorandum on consultation parameters was that they wish to consult on the full contractual entitlement, which, we understand, includes contract assignments. Further, a number of future water assignments are expected to be executed in the near future that involve SLU contractors:

Centinella WD to WWD  
Widren WD to WWD  
Broadview WD to WWD  
San Luis WD to city of Santa Nella.

We were of the understanding, based on discussions with the South Central Area Office and the July 19, 2004 memorandum, that such assignments would be part of the consultation on execution of long term water service contracts. Whether or not Reclamation chooses to combine the separate contracts that may be accumulated by a given contractor through execution of CVP water assignments, the net effect of the assignments is an increased federal water entitlement for that contractor, and, even with shortages, the potential for more water to be delivered. We are unable to identify a discussion of these assignments in the BA, and note an overall inconsistency between the accumulation of contract assignments by some contractors, the ease with which water can be transferred and exchanged under the CVPIA (and projected population growth in some of the SLU contract service areas as noted in Table 2 of BA, page 11]) as facilitated by new projects (e.g., SDIP and the SWP/CVP intertie), and Reclamation's conclusion that, during the next 25 to 40 years, nothing will change within water districts because the same amount of water will be delivered to the same places. The water needs assessments for at least some of the contractors (e.g., cities of Avenal and Coalinga) project full contract deliveries to meet M&I demands in 2025, whereas recent historic deliveries were well below maximum contract quantities.

**Information Need #11:** Reclamation needs to clarify issues related to water assignments in the BA. Our understanding is that Reclamation will examine the effects of water assignments to listed species as both an increase in the contractual entitlement of the receiving water district, and as a corresponding decrease in the contractual entitlement of the district which will no longer receive that water. Reclamation should include all reasonably foreseeable assignments in the full contract quantities of this consultation, and analyze these increases in contract quantities in the effects analysis of the BA.

Contract Provision: Groundwater Replenishment

The existing long-term water service contract for Westlands Water District includes a provision that CVP supply may be used either directly or indirectly to replenish depleted groundwater (Pg 53 of BA). However this appears inconsistent with the statement (on page 13 of BA) regarding the Water Needs Assessments that states, "Reclamation did not include any deep percolation from fields as recharge." Will the new contracts for Westlands (and any other SLU contractor) have such a recharge provision? Where would recharge areas be placed? Would they likely be placed in areas that have never been cultivated or outside the CVP POU? Would this result in impacts to listed species?

**Information Need #12:** Reclamation will provide information on which contracts include the contract provision of groundwater replenishment. Further, Reclamation shall analyze potential effects of this recharge provision on listed species and provide that information to the Service. Effects should be analyzed based on the extent of the entire groundwater basin, not just CVP water districts.

Water Needs Assessments

We note that the water needs for Pacheco, Panoche and Westlands WD's based on 1989 water needs whereas the water needs assessments of other contractors in the SLU are based on late 1990's water usage. Isn't there more recent data for these 3 districts that more accurately depicts their current water usage and incorporates more recent changes in land use (e.g., changes from row crops to permanent crops, land retirement, etc.)?

It is our understanding that justification for increases to CVP contract allocations (e.g., via CVP water assignments) are based on a water needs analysis and that such an analysis has been completed for Westlands Water District. However, according to Tracy Slavin of Reclamation's Regional office in Sacramento, the water needs analysis for Westlands Water District is 2.5 years old and does not include any permanent retirement of land from irrigation that has taken place in Westlands since the water needs analysis was completed (pers. comm. Tracy Slavin, U.S. Bureau of Reclamation, Sacramento, April 27, 2004). At the UC Salinity Drainage Task Force Meeting in Sacramento on March 25, 2004, Thaddeus Bettner (Deputy General Manager – Resources, Westlands Water District) noted that at the end of 2004, Westlands Water District will have acquired 102,878 acres of agricultural lands within the district to be retired from irrigation. The Service therefore requests that Reclamation update the water needs assessment for Westlands Water District to reflect the reduced irrigated acreage within the District, and provide such water needs assessment to the Service with a request for formal consultation on this project.

**Information Need #13:** Reclamation should revise the water needs assessments for Pacheco, Panoche and Westlands WD's to reflect a more recent baseline of water usage within these districts. Reclamation should further revise the water needs assessment for WWD to include a reduction in irrigated acreage as a result of permanent land retirement within the district.

Attachment E.11. Land Retirement Proposal – WWD

Attachment E of the BA includes a 2-page document on proposed land retirement in WWD. This document notes that, "...the United States would purchase up to 200,000 acres of drainage-impacted lands at fair market prices from willing sellers and agree to provide Westlands a reduced but more reliable CVP water supply. In return, Westlands would relieve the United States of its obligation to provide drainage and dismiss its application now pending with the State Water Resources Control Board to appropriate water from the San Joaquin River."

It is unclear if this attachment is meant to be integrated into the project description of this BA. Further, the attachment does not provide specifics to exactly what the reduced contract quantity is or what the improved reliability would be. Lastly, if this proposal were adopted, it is unclear how this would affect the outcome of the ongoing consultation and what process would need to be implemented to ensure NEPA and ESA compliance.

**Information Need #14:** Reclamation needs to clarify how this proposal pertains to the existing consultation of SLU long term contract renewals. Further, if this proposal is implemented, Reclamation should identify the process which would be followed to ensure adequate NEPA and ESA compliance.

Consistency with Municipal and Industrial Water Shortage Policy

Page 91, 3<sup>rd</sup> paragraph of the BA is inconsistent with existing/proposed Reclamation M&I shortage policy. As the BA notes, "A related concern if CVP water is converted from irrigation purposes to M&I proposed in the San Luis Unit is that the water used for M&I purposes would be accorded a higher priority for reliability of delivery than the water delivered from irrigation." This is inconsistent with the M&I shortage policy analyzed in the CVPIA PEIS (based on the June 9, 1997 CVPIA Administrative Proposal on Urban Water Supply Reliability) and the M&I Water Shortage Policy administrative draft EA which we received on September 30, 2004. These M&I shortage policy documents assume that contracts that change purpose of use after 1994 from irrigation to M&I maintain agricultural shortage provisions (based upon M&I contract amounts as determined as of September 30, 1994 and first published in Schedule A-12 of the 1996 M&I Ratebook, or contract amounts in Public Law 101-514, or contract amounts in amendatory contracts completed since 1994).

**Information Need #15:** Reclamation should rewrite this paragraph to ensure consistency with the existing M&I Water Shortage Policy described in the 1997 CVPIA Administrative Proposal on Urban Water Supply Reliability and/or and the M&I Water Shortage Policy administrative draft EA which we received on September 30, 2004.

Inconsistency between Land Uses Described in BA and Land Use Maps in Attachment C

Attachment C of the BA includes figures showing land use and natural community types for SLU Contractors. Of particular note are the land use maps for the cities of Avenal and Coalinga. For example, land and water usage within the City of Avenal is described on page 47, "...encompasses 19.5 square miles of which 2.5 miles are urbanized. The City's sphere of influence contains an additional 20.5 square miles. The City's planning area, both the lands within the city limits and its sphere of influence, uses all of its CVP water supply for M&I uses...Avenal does not pump any groundwater. The poor quality of the groundwater and its high concentrations of sulfate, nitrates, and sodium preclude its use for domestic purposes." However, the maps in Attachment C of the BA show a significant portion of the City of Avenal's service area as being in agricultural uses. A similar description is found on page 48 of the BA on the City of Coalinga which notes that the sole source of water for the city of Coalinga is their CVP allocation. How does the land use discussion in the BA agree with land use maps in Attachment C which show significant portions of these cities service areas as being in agriculture?

**Information Need # 16:** The description of the land and water uses in the body of the BA should be consistent with the land use maps in Attachment C of the BA. The BA should explain how a significant portion of both the city of Coalinga and Avenal service areas include agricultural land uses, even though the sole source of water to these service areas are for M&I uses.

Thank you for taking time on November 3, 2004 to discuss with us the information we have requested in this memorandum. We look forward to working with you to develop information we need to initiate consultation on long term water service contracts for the SLU. Until we receive the above requested information, we will not begin the formal consultation process. As we discussed on November 3, 2004 we will continue to prioritize the consultations on long term contract renewal for City of Fresno, Delta Mendota Canal Unit, Contra Costa Water district, and the O&M consultation on water conveyance facilities, while working with you to develop information for the consultation on the SLU contracts. We appreciate the assistance we have received from the Fresno Office during the consultation process.

If you have any questions or concerns about this consultation or the consultation process in general, please contact Jan Knight, Susan Jones or Joy Winckel of my staff at the letterhead address or at (916) 414-6600.

Attachment

**Table 6**  
**Listed and Proposed Species with the Potential to Occur in the San Luis Unit Action Area**

Species	Federal Status	Likelihood to Occur in the Action Area	Critical Habitat Designated*
<b>Plants</b>			
California jewelflower ( <i>Caulanthus californicus</i> )	Endangered	Low	No
Palmate-bracted bird's beak ( <i>Cordylanthus palmatus</i> )	Endangered	Low	No
San Joaquin woolly-threads ( <i>Monolopia congdonii</i> )	Endangered	High	No
<b>Mammals</b>			
Giant kangaroo rat ( <i>Dipodomys ingens</i> )	Endangered	High	No
Fresno kangaroo rat ( <i>Dipodomys nitratooides exilis</i> )	Endangered	Low	Yes
Tipton kangaroo rat ( <i>Dipodomys nitratooides nitratooides</i> )	Endangered	Moderate	No
Riparian woodrat ( <i>Neotoma fuscipes riparia</i> )	Endangered	Low	No
Buena Vista Lake shrew ( <i>Sorex ornatus relictus</i> )	Endangered	Unknown	No
Riparian brush rabbit ( <i>Sylvilagus bachmani riparius</i> )	Endangered	Low	No
San Joaquin kit fox ( <i>Vulpes macrotis mutica</i> )	Endangered	High	No
<b>Birds</b>			
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	Threatened	Low	No
California condor ( <i>Gymnogyps californianus</i> )	Endangered	Low	No
<b>Reptiles</b>			
Blunt-nosed leopard lizard ( <i>Gambelia sila</i> )	Endangered	High	No
Giant garter snake ( <i>Thamnophis gigas</i> )	Threatened	Moderate	No
<b>Amphibians</b>			
California tiger salamander ( <i>Ambystoma californiense</i> , Central California Distinct Population Segment)	Proposed Threatened	Low	No
California red-legged frog ( <i>Rana aurora draytonii</i> )	Threatened	Moderate	No
<b>Invertebrates</b>			
Valley elderberry longhorn beetle ( <i>Desmocerus californicus dimorphus</i> )	Threatened	Low	No
Longhorn fairy shrimp ( <i>Branchinecta longiantenna</i> )	Endangered	Low	No
Vernal pool fairy shrimp ( <i>Branchinecta lynchi</i> )	Threatened	Low	Yes
Vernal pool tadpole shrimp ( <i>Lepidurus packardii</i> )	Endangered	Low	Yes

\* Indicates that critical habitat has been designated for these species; however, no critical habitat is located within the San Luis Unit action area.





IN REPLY REFER TO:  
FWS/EC-05-005

## United States Department of the Interior

### FISH AND WILDLIFE SERVICE


Sacramento Fish and Wildlife Office  
2800 Cottage Way, Room W-2605  
Sacramento, California 95825-1846



NOV 17 2004

### Memorandum

**To:** Regional Director, U.S. Bureau of Reclamation, Sacramento, California

**From:**   
Assistant Field Supervisor, Sacramento Fish and Wildlife Office, Sacramento, California

**Subject:** Fish and Wildlife Service Comments and Recommendations on the San Luis Drainage Feature Re-Evaluation Plan

This memorandum transmits U.S. Fish and Wildlife Service (Service) review comments and recommendations on the U.S. Bureau of Reclamation's (Reclamation) San Luis Drainage Feature Re-Evaluation Plan and associated *Administrative Draft Environmental Impact Statement* (ADEIS), dated September, 2004. The Service provides these comments and recommendations under authority of, and in accordance with, provisions of the National Environmental Policy Act (NEPA)(40 CFR Part 1500) and Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), respectively. The Service is a Cooperating Agency, as provided for in part 1501.6 of NEPA, for the San Luis Drainage Feature Re-Evaluation Plan.

Our recommendations within this memorandum were developed after review of all official documents delivered to date, with specific intent to provide a timely update of Service recommendations on the most recent version of the Project—as reflected in the ADEIS.

### HISTORY

The Service has participated in the San Luis Drainage Feature Re-Evaluation planning process for several years. In July 2003, the Service provided comments pursuant to FWCA in a Planning Aid Memorandum (PAM), and to NEPA in a separate document. Since the release of the July 2003 PAM and NEPA comments, the Service has received from Reclamation an updated *Scoping Report* and *Plan Formulation Report Addendum* (both dated July 2004), the most recent ADEIS (September 2004), and several memoranda distributed through the interagency Mitigation Working Group relating to specific technical elements of the risk analysis and pilot selenium pre-treatment project. The Service has been providing specific comments to Reclamation on technical memoranda (informally via e-mail, and verbally in conference calls) in the interest of expediting the development of the risk assessment to inform the planning process.



The primary change in the project that precipitated a revised scoping, plan formulation, and the current ADEIS, is the addition of land retirement as part of the suite of alternatives. Comments in the previous PAM with respect to the assessment of all Out of Valley alternatives remain relevant to date. As features for these disposal alternatives have not fundamentally changed, comments contained within this memorandum will be limited to specific features of the land retirement options, mitigation planning, and risk assessment as they apply to the revised In-Valley disposal options.

## DESCRIPTION OF THE PROJECT

Major components of the project with respect to all Out of Valley alternatives have not changed since the July 2003 PAM. The comments contained in that document regarding environmental effects, ecological monitoring and mitigation remain relevant to the current ADEIS. The July 2003 PAM is submitted herein as Attachment A.

The current aspects of the Project that differ from the previous descriptions are the notable inclusion of varying degrees of land retirement; and a revised, more precise, risk assessment analysis including modified effluent water quality projections based upon drainwater pretreatment using the AbMet<sup>®</sup> treatment technology (Applied Biosciences, Inc.).

Along with the Out of Valley alternatives discussed previously; there are now four In-Valley alternatives, which are defined in the ADEIS as follows:

### 1) In-Valley Disposal Alternative

- no new land retirement
- reported as 44,106 acres retirement [Sumner Peck, Britz settlements, Central Valley Project Improvement Act (CVPIA) demo program]
- up to 3,290 acres of evaporation basins

### 2) Valley Groundwater Quality Land Retirement Alternative

- 92,592 acres total retirement (existing 44,106 acres plus an additional 48,486 acres reflecting lands with shallow groundwater quality containing >50 µg selenium/L water)
- up to 2,890 acres of evaporation basins

### 3) In-Valley/Water Needs Land Retirement

- 193,956 acres total projected retirement [existing 44,106 plus an additional 149,850 acres that include: lands with >20 µg selenium/L water, the 65,000 acres acquired by Westlands Water District (WWD) that could later be brought into production with drainage service {Sagouspe} and 10,000 acres from the Broadview Water District]
- up to 2,150 acres of evaporation basins
- represents the amount of retirement required to “retire enough lands to meet the internal water use needs of the San Luis Unit.”

#### 4) In-Valley/Drainage Impaired Area Land Retirement

- 308,000 acres total projected retirement (44,106 plus 263,894 acres representing the remainder of WWD drainage impaired lands, plus the 10,000 acres in Broadview)
- up to 1,270 acres of evaporation basins
- Excludes retirement of lands within the Northerly Area currently served by Grasslands Bypass Project

## DISCUSSION

### Range of Alternatives Including Full Land Retirement and No New Evaporation Ponds

The Service is pleased that Reclamation has included land retirement among the various project alternatives, as this was a primary recommendation of the previous PAM (USFWS, July 2003), which stated:

As identified in the Service's Mitigation Policy (Federal Register, Vol 46, No 15), the best approach to addressing adverse environmental effects is to avoid the impacts altogether. Accordingly, the Service believes land retirement would be the most effective and sustainable means to avoid the adverse environmental effects of agricultural drainage. We believe maximizing land retirement in any alternative would resolve drainage issues in a much more environmentally balanced and supportable manner. Land retirement, especially of lands most problematic for salt, boron, and selenium contamination, is consistent with recommendations in the *Rainbow Report*.

To avoid or minimize impacts to fish and wildlife resources, the draft Environmental Impact Statement (EIS) for this planning effort should include a range of land retirement alternatives, including: (1) land retirement of all drainage impacted lands, and (2) land retirement implemented in concert with a suite of other drainage reduction, treatment and disposal techniques, as recommended in the San Joaquin Valley Drainage Program's *Rainbow Report*.

The *Plan Formulation Report* identifies 379,000 acres needing drainage by the year 2050. As a result, we recommend the range of land retirement scenarios in the EIS include the potential retirement of up to 379,000 acres in the San Luis Unit Planning Area. Such an alternative would no doubt free up Central Valley Project (CVP) water for other unmet needs and beneficial uses. We believe land retirement would generally result in lower water supply demands in the CVP, provide some water for beneficial environmental uses now, and would reduce the need to construct additional future water capture and storage facilities, possibly avoiding future environmental impacts.

The Service is also pleased that Reclamation has responded to our request to add the Firebaugh sumps currently draining into the Mendota Pool to the planning effort. However, it is not clear within the ADEIS why the Northerly Area is excluded from the Drainage Impaired Area Land Retirement alternative.

Page 1-5 of the ADEIS states,

The entire drainage study area (including the lands to the north and outside of the Unit) totals approximately 730,000 acres. Of these 730,000 acres, approximately 379,000 acres would be drainage-impaired and constitute the drainage service area for the 50-year planning horizon.

As part of the drainage study area, why is the Northerly Area excluded from consideration for land retirement consistent with analyses for other Districts within the project area? By including these acres, an alternative that does not rely upon new evaporation facilities within the San Joaquin Valley can be fully evaluated.

The *Plan Formulation Report Addendum* (USBR, July 2004) states:

Also, retirement of other Northerly Unit lands was eliminated from further analysis because uncontrolled drainage flows would continue to occur. These unmanaged flows include uncontrolled seepage into deep open drains, tailwater (from continued non-Unit farms) that is not able to be recycled, and runoff from storm events. In the absence of drainage service, these uncontrolled flows would continue downstream and could reach the adjacent wildlife refuges on the San Joaquin River, resulting in adverse effects to water quality and wildlife. With no single entity responsible for managing these uncontrolled flows, the practical result would be ongoing environmental degradation for an indefinite period of time.

It is important to substantiate the above statement with either empirical data, or the specific elements and assumptions utilized within the hydrologic model that support this conclusion. Without such supporting data, it is not appropriate to eliminate the Northerly Area at this stage of the planning process.

The Land Retirement Demonstration Project monitors two sites for post-retirement groundwater levels at Tranquillity and Atwell Island (Uptain et al., 2004). Investigators reported declining water levels as the norm for monitoring wells located at both sites. This would suggest that retiring lands from irrigation generally leads to deepening the groundwater table. It is not clear whether and what changes in regional application rates are anticipated through a Northerly Unit retirement that would lead to such uncontrolled flows.

The Service, therefore, reiterates the comments from the July 2003 PAM, noting that Reclamation has not included a *full* land retirement option in the suite of alternatives to be carried to the Draft EIS stage.

## **RISK ASSESSMENT, MITIGATION, AND MONITORING**

The Service has been involved with Reclamation and the Central Valley Regional Water Quality Control Board in the Mitigation Working Group currently defining environmental mitigation and monitoring aspects of the In-Valley disposal alternatives. Specific elements and comments regarding the ongoing risk assessment have been conveyed to Reclamation and URS

Corporation (URS) in e-mail communication from the Service, as well as verbally during the monthly Mitigation Working Group conference calls.

As part of the Mitigation Working Group, the Service has been contributing towards justifiable, scientifically-sound modifications to the existing Alternative and Compensation Habitat Protocols (USFWS 1995a, 1995b). These include best-available scientific estimates of selenium concentrations in biota expected to inhabit the proposed evaporation basin facilities, exposure profiles based on broad taxonomic classes of birds expected to forage at the evaporation ponds, and specific elements relating to estimates of habitat attractiveness based on an analysis of all available empirical data from historic monitoring efforts.

In the current mitigation planning effort, the risk-assessment modeling and elements of the mitigation protocols are being modified by URS with input from the Service largely because the selenium concentrations within the proposed basins must be projected rather than measured in avian eggs. These efforts have been fruitful overall towards deriving a best scientific estimate of selenium concentrations within the system and projected effects on avifauna utilizing the sites. Notable, in this effort, is the incorporation of effects to wintering ducks—an unquantified risk not directly accounted for within the existing Service mitigation protocols. Including this risk group within the analysis involves more uncertainty given the lack of data substantiating and quantifying the attendant risks; however, these are clearly an endpoint of concern, and it is a positive step to incorporate this element into the mitigation planning effort.

The efforts of the Mitigation Working Group were proceeding to the Service's satisfaction through the fall and winter of 2003/04. However, in a memo from URS (*Draft Response to Comments from Steve Detwiler on SLDFR Administrative Draft EIS* dated May 26, 2004) it was indicated that effluent from the ABMet<sup>®</sup> treatment technology would enter the proposed San Luis Evaporation Basins at 10 µg Se/L. This assumption represents a critical stumbling block to the risk assessment until it can be substantiated to a reasonable degree of scientific confidence.

It has not been adequately established within the current ADEIS that the planned treatment technology will perform to the suggested standards (i.e., removing selenium from drainwater to concentrations at or below 10 µg/L). To date, we have not received any data validating the performance of the treatment pilot facilities. Until such data are publicly disseminated, the information presented in the ADEIS is simply a projection. Unfortunately, the reported problems and difficulties during the past year getting either pilot treatment unit (Red Rock Ranch or Panoche Irrigation District) to meet performance objectives have been discouraging. Data presented at the 2004 U.C. Salinity Drainage Conference by Mr. Tim Pickett of Applied Biosciences (later confirmed in a mitigation work group conference call by USBR on May 11, 2004), suggested that performance of the pilot treatment reactors fell considerably below this standard (with concentrations as high as 50 to 200 µg selenium/L).

With the considerable public investment involved in this project, and given the substantial risk, it is imperative that all elements associated with the risk assessment be justified based upon scientific standards of proof. There must be data presented to substantiate the performance of the treatment systems. This information, at a minimum, should include: volume, recovery rates and costs of the reverse osmosis process; and successful performance of the ABMet<sup>®</sup> selenium

treatment technology as measured in consistently realized selenium concentrations at or below 10 µg/L under a range of conditions. This range of conditions should encompass those likely to be encountered at full project construction, including: performance at a range of operating temperatures (reflected in seasonal variability) and a range of water chemistry profiles (at expected total conductivity and with waters of variable chemical properties reflective of conditions expected across the project area).

Furthermore, the effluent must be analyzed to confirm that the form of dissolved selenium has not been converted to more bioavailable reduced forms. It would be advantageous to provide detailed analytical data documenting the speciation (chemical form) of the effluent from the ponds with enough specificity to distinguish at least inorganic selenate from selenite from organic selenides. Considering that biological reduction is an inherent property of all current treatment technologies, this is an important element to quantify and report. Previous work using similar biological processes for treatment yielded effluent with a higher toxic equivalency than the untreated water (Amweg et al., 2003).

The *Planning Aid Memorandum* (USFWS, July 2003) stated:

*Amweg et al.* (2003) recently reported in detail that selenium removal based on biological processes will inevitably result in the production of selenoproteins that result in treatment effluent water being more toxicologically harmful than the untreated influent. Reuse drainwater flowing into the algae-bacterial treatment system is estimated to have around 392 ppb selenate while the treatment system will discharge around 48 ppb selenate and 28 ppb selenite and organoselenium. However, our analysis of *Amweg et al.* (2003) data along with bioaccumulation factors calculated from Tulare Basin evaporation ponds shows that the treatment water discharged into evaporation ponds would be the toxic equivalent of 1,400 to 3,000 ppb selenate (Attachment B). Thus, it is possible that money allocated to treatment in Reclamation's various alternatives would actually worsen the environmental performance of the project, not improve it. Should this prove to be the case for the particular biological treatment scheme favored by Reclamation, it will have an enormous effect on the amount of mitigation required for evaporation ponds (possibly raising mitigation requirements by an order of magnitude or more). The *Plan Formulation Report* was silent on this issue.

And later,

We recommend full analysis of issues raised in *Amweg et al.* (2003) be included in the EIS for this project. If as it appears likely, that biological treatment would have to be abandoned, then size of evaporation ponds and mitigation requirements would need to be re-evaluated along with the costs for mitigation (both of which would increase enormously).

It is our contention that these questions are far from resolved at our current state of knowledge. The AbMet<sup>®</sup> treatment process is proprietary, and may differ in specific aspects from the system used by Amweg et al. (2003). However, both processes rely on the same biochemical process—the microbial reduction of inorganic selenate to organic selenides. Unless specific treatment steps to oxidize the remnant selenium in the effluent are designed and also validated to work, it

would be expected that the resulting effluent would contain higher relative concentrations of more bioavailable forms of selenium.

Ideally, the validation of the treatment technology would also include field-scale, replicated measurements of pilot evaporation facilities using effluent and organisms expected to inhabit the constructed facilities. These would include measurements of selenium uptake in vegetation, benthic, and nektonic invertebrates in species likely to inhabit the proposed evaporation ponds. To date, the pilot pond project has not been initiated, and for all parties it was agreed that a summertime experimental period was the desired goal. However, it appears that Reclamation is going forward in the EIS under the presumption that treatment will perform to a very high standard without adequate field testing of the system.

The lack of empirical data to support the 10 µg/L effluent projection is a critical limitation within the risk assessment. Until the aforementioned field trials and analytical data are collected to substantiate this reduced waterborne selenium projection for the proposed evaporation ponds, the foundation for the risk assessment is purely speculative. It is the Service's opinion that it is not scientifically justified to assume this lower waterborne selenium concentration in the risk assessment model to define mitigation requirements.

The Service suggests that this is not the most prudent foundation from which to base alternatives selection for a project of such significant magnitude. A more prudent approach would be to run the mitigation analyses (and subsequent cost analysis) under the presumption of no treatment, while concurrently providing figures based on the projections assuming successful treatment. The mitigation protocols, once finalized, are discrete quantitative models that are capable of generating values under both scenarios with little additional effort. The calculation is a simple matter of changing the input value in the spreadsheet.

## **Other Effects**

Toxicological effects from drainwater constituents other than selenium (e.g., boron, salt toxicosis, and salt encrustation) are currently not quantified within the ADEIS to a degree commensurate with their potential risk. With concentration of reuse facility drainwater through reverse osmosis a part of the plan, this issue may become increasingly significant.

Ohlendorf and Hothem (1995) documented boron concentrations that may have reached levels of toxicological significance in widgeongrass collected at Kesterson Reservoir. Gordus et al. (2002) documented salt toxicosis and physical encrustation on feathers in wintering ruddy ducks using an evaporation basin similar in design to the proposed San Luis ponds. The authors identified a total salinity (TDS) level of 50,000 mg/L as the threshold for high risk of salt encrustation during winter months when temperatures are at or below 32°F. The projected total salt concentrations for the San Luis ponds (expected to range between 24,000-52,000 mg/L) are within this hazard threshold. These are assumed to be influent concentrations, and evaporation will only further increase TDS into potentially dangerous levels.

The current pond design is likely to attract high numbers of ruddy ducks and coots during the coldest months of the year. Even if we assume that selenium pretreatment renders biotic



selenium concentrations at the San Luis ponds to the lower region of ecotoxicity, the attribute of extraordinarily high total salinity may result in significant risks to aquatic birds using the sites. Contingencies for this occurrence may necessitate costly measures for bird exclusion (e.g., netting), or perhaps even pond closure if mortality rates are considerable.

### **Timing and Extent of Mitigation**

During the mitigation team conference call of October 5, 2004, there was discussion about contingency plans, up-front obligations, monitoring, and mitigation feasibility cost estimates. It was suggested that a certain amount of mitigation could either be defined as part of the project, or left open as potential mitigation (following monitoring results and phased in with development of project actions).

The current evaporation basins within the San Joaquin Valley are operating under agreements involving the provision of alternative and compensation habitat under the terms defined within the Service's Alternative and Compensation Habitat Protocols (USFWS, 1995a and 1995b). These agreements were entered into *post hoc* (since the ponds already were in operation once the adverse environmental risks were identified and quantified) in order that pond operators could meet and renew obligations under their Central Valley Regional Water Quality Control Board Waste Discharge Requirements (WDR's).

It seems the most logical and consistent approach to identify and commit up front to the same amount of mitigation that the existing evaporation basin owners are expected to meet—namely that prescribed within the Service protocols. The acknowledged difference in the case of the San Luis Drainage Feature Re-Evaluation is that the evaporation basins (to the extent these are elements of the preferred alternative) are yet to be constructed.

### **Mitigation Monitoring Efforts**

In the most recent memorandum from URS, *Mitigation Calculations for SLDFR In-Valley Alternatives* (dated October 10, 2004), the specific nature of the phased mitigation plan is proposed. This memorandum (as with the current ADEIS) does not adequately address the issue of mitigation monitoring. This element represents both a significant source of the operations and maintenance cost, and the only feasible working measure by which to evaluate and adjust future mitigation needs. To reiterate the recommendation from the July 2003 PAM:

The in-valley alternative will require long-term ecological monitoring of the evaporation ponds and the mitigation sites. While Reclamation briefly acknowledges these needs (USBR 2002: 5-31, 6-21, 6-22), there has been no indication that any monitoring plans have been formulated. Specific monitoring plans should be formulated and the results presented for agency and public review. Because of the large size of the proposed evaporation ponds, monitoring plans must anticipate the potential for local (on-site) as well as landscape scale effects and must address a full spectrum of chemical toxicity (more than just selenium, e.g. boron), epizootic risks (e.g., botulism), physical risks (salt encrustation of waterbirds), and operational risks (incidental to pond operation and maintenance activities). Also, monitoring plans must anticipate risks to on-site resident breeding birds, wintering birds, and spring/fall migrant populations.

On February 25, 2002, the Service provided an evaporation pond analysis, San Luis Unit Drainage Re-evaluation - Evaporation Ponds, which included mitigation, monitoring, and cost information. Our evaporation pond summary identified costs that could reach into the billions of dollars over a 50-year project life expectancy. The commitment of evaporation pond management, mitigation, and monitoring should be fully quantified, disclosed, and evaluated so as to provide equal consideration for fish and wildlife resources.

### **Lack of Consideration for Potential Effects at Reuse Facilities**

The ADEIS fails to address risk associated with the proposed reuse facilities. The July 2003 PAM stated:

As identified in the *Plan Formulation Report*, reuse facilities would be managed to allow contaminated groundwater to rise within 4 feet of the surface as a drainwater storage tool. Groundwater at this level can reach the surface through evaporation processes and bring with it high levels of salt and selenium. Concentrations of selenium in this groundwater are expected to reach 600 ppb and have the potential to exceed 1,000 ppb (the State hazardous waste level). Any water pooling on the surface for longer than a few days (as documented at Red Rock Ranch by California Department of Water Resources biologists) could provide contaminated food items to numerous species of birds. Storm events of sufficient size can potentially transport selenium-contaminated water to sensitive water supply channels and wetlands. Reclamation's pilot land retirement program has explicitly recognized the ecological risks associated with allowing seleniferous shallow groundwater to rise closer than 7 feet from the ground surface, yet the San Luis Plan Formulation Report did not identify such risks, promoted raising water tables to well within capillary-evaporative-wicking distance from the land surface, and did not propose a monitoring plan to document potential environmental effects.

These comments remain relevant within the current discussion. Additionally, results from monitoring at the Panoche Drainage District Reuse Facility revealed the consequences of mishaps at such sites when a pasture was accidentally flooded over a period of approximately 3 weeks during a critical time for nesting shorebirds. Eggs from species that nested in the pasture contained significantly elevated concentrations of selenium—sufficient to cause not only reduced hatchability, but also overt embryonic abnormalities.

Another associated risk factor is involved with siting extensive acreages of reuse (e.g., alfalfa fields) adjacent to large evaporation basins. If the reuse areas (along with uplands associated with alternative habitat) provide sufficient nesting substrate for dabbling ducks, and the ponds themselves prove adequate foraging areas, conditions would exist for significant take of migratory waterfowl. The magnitude of this risk would not be fully revealed before the facilities are constructed and in operation—perhaps too late to do more than cease operation of the entire facility as a contingency. Reclamation should, therefore, include detailed plans regarding siting, crop selection, and function of the reuse facilities in coordination with the Mitigation Working Group to anticipate and account for this possibility.

Despite the best intentions and engineering, mistakes are inevitable; and prudent project planning involves contingencies for such episodes. For aquatic species, compensation habitat could be provided to replace losses at the proposed reuse facilities. The Service has data associated with avian nesting activity and egg selenium concentrations at the Red Rock Ranch and other reuse facilities. To the extent data are available from the Panoche reuse facility, this information could be included as part of a general risk assessment for reuse facilities to estimate the appropriate

acreage of compensation habitat needed to offset eventual losses at the proposed San Luis reuse facilities.

Much attention has rightfully been placed upon impacts to aquatic resources in the risk assessment and mitigation planning. The prospect of 19,000 acres of reuse facilities, as well as upland areas planned as part of the evaporation basin mitigation proposal, introduces the important element of upland threatened and endangered species, and potential effects to individuals that may be attracted to the nuisance created by contaminated habitat. The greatest potential for listed species impacts from the alternatives considered in In-Valley Treatment options would likely occur at the reuse sites. Service biologists have repeatedly noted at agency meetings that Reclamation will need to perform a risk analysis of reuse sites and provide that analysis with the Endangered Species Act initiation materials for the San Luis Drainage Feature Re-evaluation. A discussion of this risk factor should be included in the Draft EIS and mitigation planning effort.

### **Inherent Uncertainty**

The ecotoxic model cooperatively derived as part of the risk assessment, along with the efforts towards refining the current Service mitigation protocols, generally represent the best-available scientific effort towards defining appropriate project mitigation requirements. Certain elements (chiefly the assumptions about selenium concentrations based on pretreatment) remain a point of contention; however, the overall process has progressed well.

Despite this effort, and even given as much money as has been spent on drainwater research, our knowledge base is still incomplete. For example, the dietary thresholds used for the wintering ducks risk assessment are derived from limited studies under laboratory conditions. The multivariate factors facing wild populations of birds (stressors including dietary limitations, metabolic cost of predator evasion, disease challenge, etc.) may render lowest observed effect concentrations derived in the lab under-protective for free-ranging waterfowl. The empirical database used to derive bioaccumulation factors is actually limited to relatively few data points from a small number of sites. Given site-specific differences acknowledged in the ADEIS, it is unclear how generally applicable our model predictions may prove. Finally, the ponds being constructed are on an unprecedented scale, and properties may emerge that we have yet to anticipate. These may include significant environmental impacts that could require impractical mitigation measures to continue operation of the project.

Even with our best available science, what we have is a predictive model that is only as strong as the available database feeding the calculations. Building a margin of safety, by quantifying to the best of our ability the attendant uncertainty in model predictions (or at least qualitatively and clearly placing this caveat on the risk analysis) is an important part of informing the public about the risks associated with the project. This should be expressly communicated and quantified such that project engineers can properly assess the feasibility of providing adequate mitigation measures, and economists can factor accurate numbers into the operations and maintenance budget projections using appropriately conservative estimates.

## COST

As discussed above, the mitigation and monitoring planning efforts are not defined in the ADEIS to a scientific standard sufficient to allow for confident predictions of the environmental risk associated with key elements of all In-Valley disposal alternatives. As these elements constitute a significant proportion of the total cost of each alternative, the cost analysis cannot be adequately finalized. The cost analysis is predicated on an incomplete risk assessment (see above), and, therefore, the mitigation and monitoring costs factored into the operations and maintenance budget for the evaluated alternatives are not accurate. It is unclear how, short of a full evaluation of this element, Reclamation can conclude as in the *Plan Formulation Report Addendum* (USBR, July 2004; page 3-18) that:

Comparison of the Federal cost for land retirement (land acquisition cost, management cost) versus Federal cost for collection, treatment, and disposal indicated that land retirement was more costly. In other words, it cost more to avoid drainage through land retirement than to collect, treat, and dispose of the drainwater.

It would be useful to include a detailed appendix in the Draft EIS documenting assumptions made throughout the economic analysis to substantiate final figures and provide sufficient transparency for agency and public evaluation of the specific factors incorporated into the alternatives selection process. This analysis should include, at a minimum, detailed explanations of the figures used to calculate costs such that each specific item within the cost analysis is explicitly listed and justified.

An explanation of benefits assumed through each of the presented alternatives would also be important. One of the critical benefits from the varied land retirement alternatives the Service has identified is the potential value of the water freed up from the retired lands. This commodity not only has direct and significant value in proportion to the volume generated, but it represents a substantial savings when evaluated on the basis of avoided costs for generation of new water supplies within the CVP.

Our rough calculations (based on figures provided by Reclamation) show that for the Westlands/Westplains area, a water contract reduction of about 50 percent could potentially occur if 298,000 drainage-impaired acres are retired. Retiring this land could yield about 230,000 acre-feet of average annual water supply for reallocation. In comparison, the Upper San Joaquin River Basin Water Storage Investigation determined that increasing project yield by 225,000 acre-feet annually via constructing new reservoir storage would cost between \$0.8 to \$1.7 billion. This significant benefit has not been evaluated within the current cost comparisons analysis feeding the selection of alternatives.

## WATER NEEDS

The Service believes that the EIS would benefit from a clear discussion of WWD's water needs in light of land use modifications since 1989, and ongoing water contracting issues within the region. WWD's 1.15 million acre-foot contract is identified for about 606,000 acres within its authorized boundaries. About 104,000 acres are currently retired or fallowed, yet the contract

quantities have remained unchanged. It is not clear how retiring up to 50 percent or more of WWD lands (in the case of the Impaired Lands alternative) would not make water available for other unmet CVP needs. It is our understanding, based on discussions with Reclamation's Regional office in Sacramento, that the water needs analysis for WWD is 2.5 years old and does not include any permanent retirement of land from irrigation that has taken place in WWD since the water needs analysis was completed (pers. comm. Tracy Slavin, U.S. Bureau of Reclamation, Sacramento, April 27, 2004). Reclamation should clarify how the water needs analysis can be unmodified if the irrigated acreage is declining.

We further note that the water needs assessments for Pacheco, Panoche and Westlands WD's are based on 1989 baseline water needs whereas the water needs. Reclamation should be using more recent data for these three districts that more accurately depicts their current water usage and incorporates more recent changes in land use (e.g., changes from row crops to permanent crops, land retirement, etc.)?

The EIS should discuss in more detail the anticipated fate of the additional water in the context of changing land and water use patterns. For example, have considerations been made for the possibility that increasing irrigation to certain lands may create new drainage and salt disposal issues on previously unimpaired areas? There is a significant area of land within the contractors' service area boundaries in the San Luis Unit that are "expansion lands" and have not been permitted by the State Water Resources Control Board to receive CVP water (as stipulated in the Revised Water Right Decision 1641, dated March 15, 2000, part of which pertained to the Petition to Change and Consolidate Places of Use and Purposes of Use of Water Under Certain Permits of the CVP). Would this freed-up water from retired lands be potentially reallocated to these expansion lands? The existing expansion area in the San Luis Unit includes significant acreage that currently is important habitat to a number of federally listed upland species. Issues related to use of water made available by land retirement should be addressed in the Draft EIS.

## **LINKAGE TO RELATED AUTHORITIES**

We believe Reclamation, in its efforts to solve San Luis Unit drainage issues, should fully consider and include mandates and directives as outlined under the Central Valley Project Improvement Act (CVPIA), the CalFed Bay/Delta Program, the Endangered Species Act, the Clean Water Act, and the Migratory Bird Treaty Act. The CVPIA [Section 3406(b)(3)] includes permanent land fallowing as a mechanism to acquire water for fish and wildlife purposes, and Section 3408(j) includes purchase of water rights and purchase and idling of agricultural land to increase project yield. Likewise, reducing San Luis Unit water demands and freeing up water for other purposes would contribute towards CalFed's goal to improve water supply reliability. Furthermore, removing drainwater contaminants from discharge to the San Joaquin River would contribute to CalFed's Bay-Delta ecosystem improvement goal.

By focusing on long-term, sustainable ecosystem values, we believe Reclamation would be better able to balance water supply with demand, provide for truly sustainable agriculture and improved water quality, while increasing the quantity and quality of San Joaquin Valley habitat—possibly providing for the recovery of numerous listed species, and the protection of millions of migratory birds.

## LAND USE, RETIREMENT, AND ENDANGERED SPECIES RECOVERY

The definition of “retired” lands needs to be further refined. The ADEIS currently defines land retirement as “...a measure that removes land from irrigated agricultural production, reducing the need for drainage service on remaining lands.” The Service finds this definition insufficient when considering Federal Agency responsibilities to assist in long-term protection and/or recovery of listed species. There is no clear discussion or indication of how retired lands would be managed, or the period of time these lands would remain retired. If land is merely “let to rest,” as we interpret the result of the existing definition, there is no long-term benefit to listed species, as that land may eventually be brought back into agricultural production (*e.g.*, when further water resources become available). If “retired lands” continue to be “managed” by discing, mowing, or burning twice annually to prevent colonization by weedy plant species, no benefit for listed species (*e.g.*, burrow-dwelling, granivorous kangaroo rats) would be realized. If “retired land” means it can be dry-land farmed (*e.g.*, wheat) with minimal or no irrigation water, then it would have no benefit for listed species, as it cannot be restored to native habitat capable of sustaining those species. Additionally, if areas of land are retired for an extended period of time (*e.g.*, 10 years), listed species may have sufficient time to colonize that land only to be eventually extirpated once the land comes back into production.

The Service recommends the definition of retired land be explicitly clarified in the Draft EIS to include the anticipated disposition and timeframe for the land being retired. Ideally, from an endangered species perspective, retired land should be protected through conservation easement, restored (if necessary), and managed in perpetuity so that it contributes to the survival and recovery of listed species. The conservation easement would be held by a third party (not the landowner) that would be responsible for enforcing the provisions of the easement. Operation and management plans for conservation easements should be developed for retired lands that identify management, maintenance, and monitoring costs; and those lands should be endowed by a non-wasting endowment fund.

The location of retired lands based solely on groundwater considerations would not necessarily provide habitat of sufficient quality, based on the discussion above, in locations deemed most beneficial for listed species. The Service’s 1998 *Recovery Plan for Upland Species of the San Joaquin Valley* recommends “strategic” land retirement as a recovery action to reduce the effects of habitat fragmentation on listed species. The importance of the word “strategic” cannot be understated. Land retired in areas where no listed species currently exist, or where listed species cannot disperse to, or through, has no value to endangered species or their recovery.

However, if land must be retired due to drainage impairment, a strategic approach must be taken to ensure that land will be retired in locations where it benefits listed species. The Draft EIS should further evaluate the placement of evaporation basins, mitigation habitats, and reuse facilities with respect to existing areas that serve endangered species recovery. Ideally, retired land should be comprised of large contiguous blocks of land (5,000 acres or greater) that are interconnected with linear habitat serving as dispersal corridors (*e.g.*, canal right-of-ways). These large blocks of land would serve not only as habitat for species with smaller ranges (*e.g.*, kangaroo rats, plants, blunt-nosed leopard lizards, *etc.*), but also would serve as “stepping stones” for species with larger home ranges that require dispersal habitat to persist in perpetuity (*e.g.*, San



Joaquin kit fox, see discussion below). Strategic land retirement and subsequent establishment of habitat conservation areas is the most cost effective and rapid route to the recovery of the San Joaquin kit fox, an umbrella species for several other species in the San Joaquin Valley (USFWS 1998).

The Service is concerned the proposed alternatives would negatively modify existing land use patterns. Currently, non-agricultural areas, predominantly on the western side of the San Luis Unit, support threatened and endangered species by providing necessary breeding and dispersal habitat. For species such as the San Joaquin kit fox, dispersal habitat is critical to their overall survival and recovery. The lack of occasional genetic exchange between populations isolated due to habitat fragmentation increases the risk of genetic bottlenecks, and eventually leads to population decline due to inbreeding. Inbreeding and loss of genetic diversity due to chance (stochasticity) are inevitable in small populations. These reduce reproduction and survival (inbreeding depression) in the short-term, and diminish the capacity of populations to evolve in response to environmental change in the long-term (Frankham *et al.* 2002). For example, Ralls and Ballou (1983) reported that inbred individuals showed higher juvenile mortality than outbred individuals in 41 of 44 (93 percent) captive mammal populations. In the wild, inbreeding depression would be expected to be higher than in captivity due to the harsher environmental conditions (Frankham *et al.* 2002).

If surplus water resources freed from land retirement were shifted upslope for purposes of land conversion, these conversions would result in fragmentation of existing breeding and dispersal habitat, further isolating populations, ultimately contributing to the extinction of species such as the San Joaquin kit fox.

The Service is willing to convene an internal Land Retirement Advisory Committee with the primary objective of assisting Reclamation and the current Mitigation Working Group with this element of project planning such that siting, disposition, and management of the retired lands benefit the recovery of listed species to the maximum possible extent.

## **EVAPORATION BASINS VERSUS LAND RETIREMENT**

The four purpose and need objectives used to develop the proposed alternatives presented in the ADEIS are:

- 1) Drainage service will consist of measures and facilities to provide a complete drainage solution, from production through disposal, and avoid a partial solution with undefined components.
- 2) Drainage service must be technically proven and cost-effective.
- 3) Drainage service must be provided in a timely manner.
- 4) Drainage service should minimize adverse environmental effects and risks.



It is the Service's position that the most cost-effective, practical, environmentally-preferred alternative would favor source reduction as the most logical means of avoidance. In this light, maximizing land retirement within the impaired area of the San Luis Unit seems the strategy most consistent with the purpose and needs statement above. Following is a point-by-point presentation of the case for *full* retirement (379,000 acres) of drainage impaired lands.

Purpose and Need Statement 1: *Drainage service will consist of measures and facilities to provide a **complete** drainage solution, from production through disposal, and **avoid a partial solution with undefined components**.* <Emphasis added>

Service policy states that there is a preferred course when defining mitigation for Federal actions with potential negative environmental effects. These preferred strategies were defined by the President's Council on Environmental Quality and are (in order): avoidance, minimization, rectification, reducing or eliminating the impact, and compensation. It is self-evident that source reduction measures constitute the best means of avoidance. In this light, the previous PAM (USFWS, July 2003) recommended land retirement as a viable and preferred solution to the drainwater problem.

Part of any complete solution, from the perspective of the public trust mandate of the Service, includes meeting the goals and objectives of the Service's mitigation policy. Any solution that falls short of providing adequate mitigation would, by definition, be **incomplete**.

Drainage solutions that carry significant risk and uncertainty and are of a sufficient magnitude such that their environmental impacts are unmitigable, may be impractical to implement or eventually cease because they fail to comply with established environmental regulations. Such a solution is not secure, and by definition is only **partial**.

The Service believes development of the mitigation plan as defined in the ADEIS and reflected in the direction of discussions within the Mitigation Working Group is inadequate, and therefore an **undefined component**.

Purpose and Need Statement 2: *Drainage service must be **technically proven and cost-effective**.*

As discussed in the section on **Risk Assessment, Mitigation, And Monitoring** above, the components of the In-Valley alternatives as described in the ADEIS (specifically including a risk assessment predicated on successful ABMet<sup>®</sup> selenium pre-treatment) remain **technically unproven**. As discussed in the **Cost** section above, it is premature to identify project costs when specific mitigation components (acreage and quantity of water needed to provide alternative and/or compensation habitat) have yet to be defined. Moreover, the assessment of benefits associated with the value of surplus water generated through retirement (or as avoided costs of producing new supplies through construction of new dams) has not been applied within the current analysis. We believe this accounting would also heavily favor land retirement for impaired lands as the most **cost-effective** strategy when compared to disposal options.

Purpose and Need Statement 3: *Drainage service must be provided in a timely manner.*

Considering that no new siting, permitting, and construction are required to retire existing impaired lands, this option could be implemented in a more timely manner when compared to other alternatives. The Service agrees that a solution to the drainage problem should be implemented as soon as possible. We view full retirement of these marginal farmlands as the most sensible and efficacious means of completely and finally solving the drainage problem within the San Luis Unit.

Purpose and Need Statement 4: *Drainage service should minimize adverse environmental effects and risks.*

From the environmental perspective, the preference of the Service is, and has been, no new evaporation facilities. Alternatives that eliminate or minimize the acreage of evaporation facilities are, therefore, environmentally preferred. The proposed modifications to basin design over and above current state of the art (e.g., using sheet piling for cell dividers) may help reduce, though not eliminate risks to nesting avifauna. In the case of wintering diving ducks and coots, these may have no influence on foraging activity, basin use, and therefore risk.

The greater the amount of land retirement, the lesser the requirement for evaporation ponds, reuse facilities, and the attendant mitigation to compensate for the negative environmental effects of these disposal alternatives. Given the incredible amount of risk and uncertainty inherent in roughly doubling the acreage of evaporation facilities potentially containing selenium in biota, and salts at concentrations sufficient to cause significant avian mortality, it is clear alternatives that minimize this element via effectively reducing the volume of seleniferous and saline drainage from the impaired lands within the San Luis Unit are environmentally preferred. Again, we believe *full* land retirement of the 379,000 acres identified as drainage impaired lands is the strategy most consistent with the founding purpose and need of the San Luis Drainage Feature Re-Evaluation.

## RECOMMENDATIONS

We submit the following recommendations to assist your planning and alternatives development processes and to avoid and minimize impacts to fish and wildlife resources:

1. Reclamation should provide a range of alternatives that incorporates *full* land retirement within the San Luis Service Area (including the Northerly Area) as a means to secure a safe, reliable, and permanent solution to the drainage problem.
2. Reclamation should base the evaluation of risk within the respective alternatives on a best-available-science basis. To the extent that Reclamation evaluates all project alternatives involving selenium pre-treatment, empirical data should be provided in the EIS to substantiate performance of this system. Given that this information is not yet available, it would be prudent to factor mitigation costs into the economic evaluation with the assumption that treatment will not perform as projected. It is evident that the inclusion or exclusion of successful pre-treatment is a variable of such significance that it could easily tip the scale in the economic evaluation from one alternative to another.

3. A detailed cost estimate should be derived for mitigation, monitoring, and associated operations and maintenance by the Mitigation Work Group. These estimates should be incorporated into the cost analysis for a full and accurate accounting of respective alternative costs.
4. The Mitigation Work Group should begin quantifying risk and projected take of wildlife associated with other risk endpoints, and incorporate these effects into mitigation and monitoring plans. These include salt toxicosis and salt encrustation of feathers in wintering birds using the evaporation basins, the potential effects of high boron concentrations, and wildlife losses associated specifically with reuse facilities.
5. Reclamation should consider, within the larger CVPLA and CalFed context, the interconnectedness of this project with all other regional land use and water quality initiatives, and consider the profound environmental and economic benefits of reallocating the water freed from retired lands within the San Luis Unit for other CVP needs—including environmental restoration efforts. The San Luis Feature Re-evaluation represents a significant opportunity to resolve some of the most vexing resource management problems within the northern San Joaquin Valley.
6. Reclamation should re-evaluate the WWD Water Needs assessment in light of planned and historic land retirement. Increasing water supply certainty to any district, beyond current expectations, could result in negative impacts to other beneficial uses of CVP water—notably environmental needs.
7. Reclamation should incorporate specific information regarding the anticipated use of retired water and retired lands to ensure that effects of the varied alternatives presented are consistent with threatened and endangered species recovery consistent with the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS, 1998). The treatment of these retired lands, including consideration of its siting, disposition, and management, should be such that it benefits the recovery of listed species to the maximum possible extent.

## SUMMARY

The Service believes Reclamation's analysis of the current suite of alternatives for the San Luis Drain Feature Re-Evaluation Plan does not include a complete consideration of all costs and benefits associated with land retirement, and contains incomplete and unsubstantiated mitigation and monitoring measures constituting unacceptable risks to San Joaquin Valley wildlife. We believe these alternatives must include equal consideration of fish and wildlife resources, and as such, should seek to avoid or minimize environmental affects by focusing, as much as possible, on the elimination of the need for drainage service. This includes a range of alternatives encompassing full retirement of drainage impaired lands (379,000 acres including the Northerly Area).

The San Luis Feature Re-Evaluation process is a significant undertaking with the potential to greatly help or harm San Joaquin Valley wildlife resources, depending on the decisions made through this current planning effort. It is our goal to provide meaningful FWCA-related recommendations to the San Luis Drain Feature Re-Evaluation Plan effort so as to assist Reclamation's provision of an equal consideration of conservation, rehabilitation, and enhancement of fish and wildlife resources with other project purposes. Additionally, we look

forward to working with Reclamation in this challenging endeavor under our numerous other authorities and responsibilities.

This memorandum was completed as a result of joint coordination by the divisions of the Habitat Conservation, Environmental Contaminants, and Endangered Species in the Sacramento Fish and Wildlife Office. Questions regarding contaminants and risk assessment issues associated with this memorandum can be directed to Steven Detwiler at 916-414-6604 or Tom Maurer at 916-414-6594. Questions related to NEPA and other FWCA issues can be addressed to John Brooks at 916-414-6726 or Mark Littlefield at 916-414-6581. Questions regarding threatened or endangered species should be addressed to Joy Winckel at 916-414-6676 or Harry Mcquillen at 916-414-6742.

#### Attachments

cc:

California/Nevada Office, Fish and Wildlife Service, Sacramento, CA

Bureau of Reclamation, Fresno, CA (Attn: William Luce, Area Manager)

Bureau of Reclamation, Sacramento, CA (Attn: Al Candlish, Division of Planning)

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**Attachment A: JULY 2003 Final PAM**



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
 Sacramento Fish and Wildlife Office  
 2800 Cottage Way, Room W-2605  
 Sacramento, California 95825-1846

REPLY TO ATTENTION TO:

JUL 15 2003

## Memorandum

**To:** Regional Director, U.S. Bureau of Reclamation,  
 Sacramento, California

**From:** *David J. Harlow*  
 Acting Field Supervisor, Sacramento Fish and Wildlife Office,  
 Sacramento, California

**Subject:** Fish and Wildlife Coordination Act Planning Aid Memorandum on the San Luis  
 Drainage Feature Re-Evaluation Plan

This memorandum transmits U.S. Fish and Wildlife Service (Service) recommendations on the U.S. Bureau of Reclamation's (Reclamation) San Luis Drainage Feature Re-Evaluation Plan and associated *Draft Alternatives Report*, dated October 4, 2002. The Service provides these recommendations under authority of, and in accordance with, provisions of the Fish and Wildlife Coordination Act (FWCA)(48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The FWCA requires Federal agencies proposing water resource development projects or involved in issuance of related permits or licenses to consult with the Service and provide equal consideration to the conservation, rehabilitation, and enhancement of fish and wildlife resources with other project purposes.

Our recommendations are based upon our review of Reclamation's *San Luis Drainage Feature Re-Evaluation Plan Formulation Report* (dated December 2002)(Plan Formulation Report), *Draft Alternatives Report*, *Preliminary Alternatives Report* (dated December 2001), *Draft Work Plan* (dated October 2001) for the San Luis Drainage Feature Re-Evaluation and Environmental Impact Statement (Draft Work Plan), the *Functional Analysis Study Workshop Report* (dated August 2001), Interagency Scoping Workshop documents, the San Luis Act (P.L. 86-488, dated 1960), Court of Appeals findings (Case Number 95-15300), *Draft White Paper-Mitigation Requirements Related to Evaporation Ponds in the San Joaquin* (dated July 2002), *A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley* (USDOI and CRA 1990), and other related reports and documents.

## CONSULTATION HISTORY

The Service has participated in the San Luis Drain Feature Re-Evaluation planning process for several years, as identified in Attachment A. In early April of 2003, the Service provided a draft Planning Aid Report to Reclamation for review. Subsequently, Reclamation provided associated comments May through June of 2003. As a result of those comments and their appropriate



incorporation, this PAM was completed and submitted concurrently with a memorandum focusing on Service NEPA comments as a Cooperating Agency.

## DESCRIPTION OF THE PROJECT

Through law, policy, litigation, and practice, sustaining long-term irrigated agricultural productivity in the Central Valley Project's (CVP) San Luis Unit will require adequate drainwater management. While the drainage service requirement is recognized in the San Luis Act of 1960 and confirmed in several lawsuit judgements, drainage provision methodology remains at issue. When irrigation water is provided to the San Luis Unit, a substantial area requires drainage service to remove salts from the land.

According to the project's *Draft Work Plan* (USBR 2001), the purpose of the San Luis Drainage Feature Re-Evaluation Project is "to formulate and implement a plan to provide drainage service to the San Luis Unit to achieve long-term, sustainable salt balance in the root zone of irrigated lands." The project reports consistently state its purpose is directed by the Sumner-Peck 2000 lawsuit decision to provide drainage service to the San Luis Unit. To date, this purpose statement is consistent in all associated reports. The *Draft Work Plan* also includes the following goal as a purpose component: "The desired solution will not only provide an appropriate level of drainage service to the San Luis Unit, but also will avoid impacting the social or ecological environment" (emphasis added).

The project, as currently envisioned by Reclamation, begins with on-farm and in-district drainage reduction actions that are expected to be adopted by farmers regardless of which ultimate disposal alternative is chosen by the Federal government. Those drainage reduction actions include drainwater recycling, shallow groundwater management, and canal seepage reduction. On-farm and in-district actions would then be followed by the Federal government's actions of drainage collection (from farms), drainage reuse (at four regional reuse facilities), drainage treatment, and disposal. Reclamation estimated that 379,000 acres would be drainage impaired (36,000 of which are outside the San Luis Unit), and that 254,000 acres would actually have drainage systems installed by the year 2050 (the end date of the planning horizon).

After assumed irrigator-implemented actions were incorporated, drainage service alternatives were evaluated. These alternatives include the proposed in-valley disposal (evaporation ponds), ocean disposal (Point Estero-Morro Bay), Delta-Chipps Island disposal, Delta-Carquinez Strait disposal, and no action. The major components in each alternative are as follows (USBR 2002):

### Proposed in-valley disposal

- 26,700 acres of regional reuse facilities
- Reverse osmosis treatment facility in Northerly Area
- 160 acres of selenium treatment facilities
- 5,000 acres of evaporation ponds
- 3,200 to 6,400 acres of mitigation habitat
- Estimated total present worth cost of \$946 million (2002 dollars), with an annual equivalent cost of \$59 million

### **Ocean disposal**

- 27,200 acres of regional reuse facilities
- 177 miles of buried pipeline conveyance of drainwater using existing right-of-way when possible, including three tunnels through coastal range and ten pumping plants
- Estimated total present worth cost of \$1.183 billion (2002 dollars), with an annual equivalent cost of \$73.7 million

### **Delta-Chipps Island disposal**

- 27,200 acres of regional reuse facilities
- 160 acres of selenium treatment facilities
- Utilizes existing San Luis Drain
- 191 miles of pipeline and canal conveyance using existing rights-of-way (108 miles of new construction and 83 miles of the existing San Luis Drain)
- Canals and low-head pipelines in agricultural and sparsely populated areas
- Pipelines in urban and rapid growth areas
- Estimated total present worth cost of \$1.006 billion (2002 dollars), with an annual equivalent cost of \$62.7 million

### **Delta-Carquinez Strait disposal**

- 27,200 acres of regional reuse facilities
- 160 acres of selenium treatment facilities
- Utilizes existing San Luis Drain
- 208 miles of pipeline and canal conveyance using existing rights-of-way (125 miles of new construction and 83 miles of the existing San Luis Drain)
- Canals and low-head pipelines in agricultural and sparsely populated areas
- Pipelines in urban and rapid growth areas
- Estimated total present worth cost of \$1.079 billion (2002 dollars), with an annual equivalent cost of \$67.2 million

### **No Action**

- Part of the Grassland Drainage Area's planned In-Valley Treatment/Drainage Reuse Facility would be included in the No Action Alternative. The constructed and funded components include 4,000 acres of land for planting with salt-tolerant crops
- Land retirement of 78,406 acres
- The San Luis Drain would not be used to convey drainage except for the northern area of the Unit as part of the Grassland Drainage Area
- No additional irrigated acres would be brought on line
- No new managed wildlife areas developed within the study area
- No changes to land following patterns

### **BACKGROUND**

The CVP is the nation's largest Federal reclamation project. It's dams and water conveyance facilities span the length of California's Central Valley, from Shasta and Trinity dams in the north, to Bakersfield (Friant-Kern Canal terminus) in the south. CVP water can be delivered, transferred, or exchanged for delivery throughout California. The following is a chronology of the principle events and decisions leading to the current project.

On June 3, 1960, Congress authorized the construction of the San Luis Unit (Unit) "as an integral part of the Central Valley Project," with the principal purpose of furnishing water for irrigation of land in Merced, Fresno and Kings counties, California [Public Law No. 86-488, 74 Stat. 156 (1960, the San Luis Act)]. The authorizing language of the San Luis Act directs that the "principal engineering features of said Unit shall be (a dam, reservoir, etc.) and necessary . . . drains," indicating authors of the directives recognized that providing irrigation water would require drainage service to remove salts from the service area. Accordingly, the San Luis Act expressly conditioned the construction of, and water deliveries to, the San Luis Unit on the provision of necessary drainage facilities, which could be provided by the State of California or the Department of the Interior (Department). The project's feasibility report considered constructing a system of tile drains that would empty into an interceptor drain and convey the drainage water 197 miles to the Contra Costa Delta for disposal (Section 1(a)(2), the San Luis Act).

On January 9, 1962, the Secretary of the Interior informed Congress that provisions for constructing the San Luis interceptor drain to the Contra Costa Delta had been made. Shortly thereafter, construction was started on the San Luis Unit, and deliveries of CVP water to Westlands Water District (Westlands) began in 1967.

Since 1965, nearly every congressional water and power appropriation act contained language prohibiting the establishment of a terminus for the drain until environmental concerns regarding the effect of the agricultural effluent on the San Francisco Bay could be jointly addressed by Reclamation and the State of California. To date, an environmental standard for drainwater effluent release to the San Francisco Bay has not been established.

In March of 1968, construction of the interceptor drain was initiated, and by 1975 the middle 40 percent of the drain (about 82 miles) was built. The Secretary also authorized the construction of the Kesterson Reservoir, located at the north end of the middle portion of the drain. Kesterson Reservoir was designed to store water (regulating reservoir) before it continued to the planned terminus at the Contra Costa Delta. In 1975, the Secretary suspended construction of the interceptor drain, citing questions and concerns raised by the public. Tile drains were later installed providing drainage service for about 44,000 acres of Westlands and connecting to the 82-mile long San Luis Drain and the 1,200-acre Kesterson Reservoir.

In mid-1983, waterbird nesting studies at Kesterson Reservoir revealed embryo deformities and mortalities. Extensive research conducted by Reclamation, the Service, and U. S. Geological Survey (USGS) scientists revealed that selenium from Westlands soils and groundwater was being carried in drainage water to Kesterson Reservoir and was concentrating in the biota. Like other metals, selenium can be hazardous to human and animal life when present in elevated concentrations. Unlike many metals, selenium can bioaccumulate through the food chain, so a relatively low concentration in water (parts per billion, ppb) can magnify to hazardous levels (parts per million, ppm) in animals, particularly vertebrates such as birds and fish. On March 15, 1985, the Secretary of the Interior announced the closure of Kesterson Reservoir. The sub-drains at Westlands were plugged, and as of June, 1986, the San Luis Drain was closed. CVP water deliveries continued to the San Luis Unit without associated drainage.

In 1985, affected landowners filed a series of lawsuits addressing drainage service for the San Luis Unit. In 1986, the Barcellos Judgement directed Reclamation to prepare a drainage plan for

the San Luis Unit by December 31, 1991. Reclamation submitted the *San Luis Unit Drainage Plan*, but the court ruled that it could not be implemented. Further, the court ordered Reclamation to refund \$16 million to Westlands from a drainage trust account collected through a 50 cent per acre-foot fee on delivered project irrigation water.

From 1985-1990 the Service fully participated in the five agency, Federal-State San Joaquin Valley Drainage Program (SJVDP). The purpose of the SJVDP was to investigate problems associated with drainage of irrigated agricultural lands on the west side and southern end of the San Joaquin Valley and to formulate, evaluate, and recommend alternatives for the immediate and long-term management of those problems. One of the SJVDP's principal goals was to address wildlife problems associated with subsurface drainage water generated by irrigated agricultural land in the San Joaquin Valley. Specifically, the SJVDP's fish and wildlife resources goal included four general objectives:

- Protection: Protect (or, where protection is not practicable, mitigate for the loss of) existing fish and wildlife resources from ongoing and potential impacts associated with subsurface drainage water generated by irrigated agricultural lands in the principal study area;
- Restoration: Restore (or, where restoration is not practicable, mitigate for the loss of) fish and wildlife resources contaminated with subsurface drainage water generated by irrigated agricultural lands in the principal study area;
- Substitute Water Supply: Provide adequate, clean, and reliable freshwater supplies to wildlife habitats that previously have relied upon drainage water generated by irrigated agricultural lands in the principal study area; and
- Improvement: To the extent practicable, improve fish and wildlife resources of the San Joaquin Valley.

In 1987, the SJVDP completed a preliminary review and screening of potential options for disposal of drainwater, including sites outside the valley. Subsequent to that screening, the Policy and Management Committee (composed of Directors of two State agencies and Regional Directors of three Federal agencies) with concurrence by a Citizens Advisory Committee, directed that investigative and planning efforts focus on in-valley solutions to the drainage-water disposal problems. The National Academy of Sciences and National Research Council (NRC) committee did not concur with this decision (NRC 1989). No studies on out-of-valley disposal of drainage water were funded or conducted subsequent preliminary screening actions of the SJVDP.

The final report of the SJVDP (DOI/CNP 1990) was developed around four program goals: (1) protection of public health; (2) water quality; (3) agricultural land and productivity; and (4) fish and wildlife resources. The SJVDP's recommended plan included the following major actions:

- On-farm water conservation: Improve the application of irrigation water by, for example, improving irrigation scheduling, shortening furrow runs (to improve application uniformity), and recycling surface runoff.
- Recycling and reuse of drainage water: Use of subsurface drainage water on increasingly salt-tolerant crops, and eventually on agroforestry plantations and halophyte crops to reduce the volume of drainage water for final disposal.

- Disposal into evaporation and solar ponds: Discharge drainage water into one of four types of ponds, based upon influent selenium concentrations: “nontoxic” ponds for drainwater influent of <2 ppb selenium; modified ponds with alternative habitat for >2 - <50 ppb selenium; accelerated rate ponds for >50 ppb selenium; and temperature-gradient solar-electric ponds for highly concentrated brine water.
- Farmland retirement: Cease irrigation of farmlands with the following characteristics: low agricultural productivity, shallow groundwater table, and poor groundwater quality. Reallocate water associated with retired lands to non-drainwater impacted areas for restoration of drainwater-impacted fish and wildlife habitat.
- Groundwater management: Pump groundwater from deep within the semi-confined aquifer in a coordinated manner to lower the near-surface ground-water table below the crop root zone.
- Discharge to the San Joaquin River: Discharge drainage water into the San Joaquin River and its tributaries up to their assimilative capacities, consistent with water quality objectives and criteria for the River.
- Protection, restoration, and substitute water supplies for fish and wildlife: Provide freed-up water to wetlands and waterways which previously relied on, or were impacted by, drainage water including instream flows and decontamination and restoration of drainage impacted wetlands.
- Institutional changes: Change irrigation water costs (e.g., use tiered water pricing), deliver water upon demand, use water transfers and marketing, and form a regional drainage management district(s).

The SJVDP’s final report also included the following recommendations:

- Monitoring and assessment of plan actions: Develop and implement a comprehensive long-term program to monitor various resources throughout the valley (e.g., groundwater levels, water quality, soil salinity, and contamination of fish and wildlife and agricultural crops); assess effects of plan implementation, and adjust actions accordingly.
- Database management: Implement a long-term program to manage and update database resources including hardcopy materials; electronic information (e.g., GIS, computer models and databases); and other items (e.g., maps, media samples, photos, slides, and audio and video tapes).
- Additional studies: Conduct additional studies on drainage management, geohydrology, economics, fish and wildlife, and public health.

The Service also participated in other planning and implementation efforts in the drainage problem area. These efforts included: the San Luis Unit Special Study, the *Kesterson Action Plan*, the San Luis Unit Drainage Program, and the Grassland Bypass Project.

In 1992, the Sumner-Peck lawsuit was filed, targeting the failure to provide San Luis Unit drainage service. In 2000, following several rulings and appeals, the U.S. Court of Appeals for the Ninth Circuit concluded, “. . . that the Government must act promptly to provide drainage service, but reverse that part of the District Court’s judgement that forecloses non-interceptor drain solutions” (emphasis added). Thus, the court confirmed that providing necessary

drainwater service was integrally linked to providing delivery of irrigation water, but reversed the District Court's order directing Reclamation to apply for a California State Waste Discharge Permit to the Delta in Contra Costa County.

Although Kesterson Reservoir and Westland's tile drains were closed in 1986, CVP water deliveries continued under Westland's 1.15 million acre-foot water contract. This water was primarily an inter-basin transfer as a result of constructing the Trinity dam and associated water conveyance system. This captured and stored water is conveyed, via the Sacramento River, to the Sacramento-San Joaquin Delta's (Delta) Tracy Pumping Plant for delivery to the Delta-Mendota Canal for transport south to the San Luis Reservoir and/or the San Luis Unit. Since 1991, institutional constraints have limited the Tracy Pumping Plant's export capabilities to about 59 percent of the contracted water quantities. Despite the reduction in available export water supplies, Westlands has maintained irrigation water quantities near or above contract amounts using other sources (Westlands Annual Water Reports, 1992-2000). While Westlands received less than full CVP contract water supplies, an aggressive and innovative State and Federal water acquisition/transfer program and conjunctive water uses helped maintain nearly full contract supply quantities.

Other water districts included in this San Luis Unit drainage planning effort have benefitted from drainage management via the Grassland Bypass Project. This project removes contaminated drainwater from wetland supply channels and discharges it into the San Joaquin River via the San Luis Drain. Loading restrictions were placed on the discharge to improve water quality in the river over time. On-farm and regional drainage reduction programs have usually met the selenium load restrictions to date.

## DISCUSSION

To provide equal consideration to the conservation, rehabilitation, and enhancement of fish and wildlife resources with other project purposes, the Service recommends that Reclamation seek a range of alternatives so as to provide sufficient avoidance and minimization measures for any Plan-related impacts.

We note the *Draft Work Plan* includes the following goal: "The desired solution will not only provide an appropriate level of drainage service to the San Luis Unit, but also will avoid impacting the social or ecological environment" (emphasis added). To ensure that environmental criteria are given proper emphasis and equal consideration, we believe this goal should be inserted in all future documents, including the upcoming Environmental Impact Statement (EIS).

## ***SJVDP Rainbow Report***

To the extent the drainage service alternatives are pursued as opposed to drainage elimination alternatives, the Service continues to support the recommendations of the *SJVDP Final Report* (Rainbow Report) (DOI/CNP 1990). The *Rainbow Report* recommendations are an integrated, comprehensive program of pragmatic actions that represent a consensus of many participating agencies, stakeholders, and the public. While the Service continues to support combined implementation of all components of the *Rainbow Report*, we do recognize almost 10 years has elapsed since closure of the SJVDP effort. Therefore, new technologies may have become available and could, in combination with implementation of SJVDP recommendations, be used

to address subsurface drainage needs in the San Joaquin Valley. As an example, on-going environmental protection, enhancement, and restoration measures under the CVPIA and CALFED will affect the overall focus and implementation of the SJVDP. We believe all alternatives under consideration should be evaluated for compatibility with CVPIA and CALFED environmental goals and objectives.

The Service supports evaluation of additional actions that could be implemented in concert with recommendations in the SJVDP *Rainbow Report*. Increasing the amount of land retirement and fallowing, above what was recommended by the SJVDP would reduce the need for associated drainwater treatment and disposal, and would increase related avoidance or minimization of environmental impacts. We believe actions that reduce or eliminate the need for drainage service are less environmentally damaging than drainwater and/or salt disposal actions. Environmentally sensitive actions could improve the San Joaquin River's water quality conditions and assist fish and wildlife improvement programs.

### **Project Area**

In addition to the general project description provided earlier in this report, the *Plan Formulation Report* on page 2-5, Table 2.2-1, in the column titled "Area Needing Drainage by 2050," specifically identified 36,000 acres outside the San Luis Unit study area. The current *Plan Formulation Report* does not specifically identify which point and non-point pollution sources have been included. Of particular concern to the Service are 6 agricultural drainage sumps (owned by Reclamation) that discharge concentrated drain water into the Delta-Mendota Canal from the Firebaugh Canal Water District. In addition, there are over 90 check drains along the length of the Delta-Mendota Canal that contribute an unknown quantity of drainwater contamination to the Delta-Mendota Canal and should be considered.

Anecdotal records have shown operation of these sumps and check drains in the action area have contributed to repeated exceedences of the federally promulgated and State adopted site specific monthly mean water quality objective for the Grassland Area wetland water supplies resulting in failure to protect designated beneficial uses, possibly including wildlife species such as the federally threatened giant garter snake (*Thamnophis gigas*). As a result of these exceedences, current operation of these check drains and drainage sumps has resulted in subsurface drainage contamination of Delta-Mendota Canal water that, at least annually, results in an unusable blend and may affect fish and wildlife at refuges using the water downstream. Further, the Mendota Pool, located at the terminus of the Delta-Mendota Canal and downstream of the abovementioned drainage sumps and check drains, was recently listed as an impaired water body for selenium at 2 ppb, monthly mean, as adopted by the State Water Resources Control Board on February 6, 2003, and approved by the Environmental Protection Agency on June 5, 2003.

To the extent that Reclamation is to provide drainage service, we believe drainage systems that now discharge into the Delta-Mendota Canal should be reconfigured to discharge into Reclamation's planned drainage service facilities.

### **Land Retirement**

As identified in the Service's Mitigation Policy (Federal Register, Vol 46, No 15), the best approach to addressing adverse environmental effects is to avoid the impacts altogether.



Accordingly, the Service believes land retirement would be the most effective and sustainable means to avoid the adverse environmental effects of agricultural drainage. We believe maximizing land retirement in any alternative would resolve drainage issues in a much more environmentally balanced and supportable manner. Land retirement, especially of lands most problematic for salt, boron, and selenium contamination, is consistent with recommendations in the *Rainbow Report*.

To avoid or minimize impacts to fish and wildlife resources, the draft EIS for this planning effort should include a range of land retirement alternatives, including: (1) land retirement of all drainage impacted lands, and (2) land retirement implemented in concert with a suite of other drainage reduction, treatment and disposal techniques, as recommended in the SJVDP's *Rainbow Report*.

The *Plan Formulation Report* identifies 379,000 acres needing drainage by the year 2050. As a result, we recommend the range of land retirement scenarios in the EIS include the potential retirement of up to 379,000 acres in the San Luis Unit Planning Area. Such an alternative would no doubt free up CVP water for other unmet needs and beneficial uses. We believe land retirement would generally result in lower water supply demands in the CVP, provide some water for beneficial environmental uses now, and would reduce the need to construct additional future water capture and storage facilities, possibly avoiding future environmental impacts.

### **Environmental Effects**

The current drainage investigation effort does not appear to be consistent with past drainage efforts, nor does it appear to be compatible with other on-going state-wide efforts to protect, enhance, and restore healthy ecosystems in California. We believe ongoing efforts to improve aquatic, terrestrial, and marine environments would be compromised, to varying degrees, by each of the presented alternatives. Furthermore, it is our view that no current alternative adequately provides equal consideration of fish and wildlife resources with other project purposes, nor meets the project goal to avoid adverse social and/or environmental effects.

Three of the alternatives, in-valley disposal, Delta-Chipps Island disposal, and Delta-Caquinez Strait disposal simply expand drainwater management actions that have already been documented to cause significant environmental impacts. The third alternative, discharge into the ocean, is an untested method with many unknowns. Terrestrial, marine, and/or freshwater aquatic habitats, including the Bay/Delta ecosystem, could be significantly affected, directly or indirectly, by implementing any of the alternatives. The *Plan Formulation Report* provides a feasibility level analysis on potential direct adverse biological effects of implementing project components. Potential indirect effects, like the possible bioaccumulation of selenium in the Bay/Delta, are largely left unaddressed.

**In-Valley Disposal Alternative:** We believe the attractive nuisance and hazards of evaporation ponds to wildlife, as would be created by this alternative, have been well documented by the Service and others. However, the combination of large scale and the highly concentrated nature of the discharge into these proposed evaporation ponds would be unprecedented. Our experience is that once implemented, these negative effects cannot be entirely reversed. The Service mitigation and compensation protocols, a key mitigation feature in the *Plan Formulation Report*, may not directly apply to these ponds for several reasons discussed below in the Monitoring and



Mitigation section. Biological monitoring, with contingency plans to cease discharges if unacceptable adverse effects are encountered, must be included as an adverse effect avoidance measure.

Current on-farm reuse projects are designed to manage drainwater from 1,000 acres of irrigated land. Service monitoring of these sites and recommendations to reduce selenium exposure to wildlife may not apply to the larger scale facilities necessary for this alternative. For example, methods to minimize reuse water ponding on 10 to 100 acres of salt-tolerant crops may be very difficult or impossible on a larger scale. Each of the four proposed regional reuse facilities will be around 6,500 acres in size with each designed to handle drainage from around 80,000 acres. The potential impacts of the current Panoche reuse facility (around 2,400 of the 4,000 acres are currently in operation) have yet to be fully evaluated; however, a black-necked stilt embryo deformity was found during field sampling in 2003. Waterfowl and other waterbirds are known to nest on-site and mountain plovers, a species proposed for listing, have been observed on the site during the winter. Preliminary data on eggs from three species of birds collected by the Service at the Panoche reuse facility in 2001 show selenium levels that fall within a level of concern (Grassland Bypass Project selenium guidelines). One egg from a Brewer's blackbird was found to be above the toxicity threshold of 10 ppm. This limited data set indicates that even before the project was fully operational, selenium was accumulating in biota (bird eggs) at the facility and further contaminant monitoring is warranted.

As identified in the *Plan Formulation Report*, reuse facilities would be managed to allow contaminated groundwater to rise within 4 feet of the surface as a drainwater storage tool. Groundwater at this level can reach the surface through evaporation processes and bring with it high levels of salt and selenium. Concentrations of selenium in this groundwater are expected to reach 600 ppb and have the potential to exceed 1,000 ppb (the State hazardous waste level). Any water pooling on the surface for longer than a few days (as documented at Red Rock Ranch by California Department of Water Resources biologists) could provide contaminated food items to numerous species of birds. Storm events of sufficient size can potentially transport selenium-contaminated water to sensitive water supply channels and wetlands. Reclamation's pilot land retirement program has explicitly recognized the ecological risks associated with allowing seleniferous shallow groundwater to rise closer than 7 feet from the ground surface, yet the *San Luis Plan Formulation Report* did not identify such risks, promoted raising water tables to well within capillary-evaporative-wicking distance from the land surface, and did not propose a monitoring plan to document potential environmental effects.

Delta Disposal Alternative: The USGS' *Forecasting Selenium Discharges to the San Francisco Bay-Delta Estuary: Ecological Effects of a Proposed San Luis Drain Extension* identified that selenium concentrations as low as 1 ppb in water can result in adverse environmental effects (USGS 2000). The USGS report notes that selenium bioaccumulation is much higher in the primary production organisms of the estuary than previously encountered elsewhere. Thus, the risk of adverse exposure to selenium would be magnified in high productivity areas in the Bay-Delta. The 5 ppb selenium target at the edge of a mixing zone for the Delta drainwater disposal option, as proposed in the Alternatives Report, is not relevant to the environmental impacts of selenium. This is because mixing zones are primarily intended to address acute toxicity and their use is inappropriate for bioaccumulative substances like selenium. The total load of selenium discharged into the system is a relevant discussion point not included in the *Plan Formulation Report*. Further, the EIS should acknowledge and evaluate potential implications of reasonably

foreseeable additions or changes to water quality standards such as the reexamination of the selenium aquatic life criteria. Biological monitoring, with contingency plans to cease discharges if unacceptable adverse effects are encountered, must be included as an adverse effect avoidance measure.

To further substantiate our concerns, new research results from USGS and other studies indicates that selenium in the Delta is entering the food chain at levels that are likely to impact bottom-feeding and predatory organisms (Luoma & Presser 2000). In addition, the State Water Resources Control Board (SWRCB) in their 303(d) list of impaired water bodies of the State (approved February 4, 2003), has identified sources of selenium contamination in Suisun Bay including agricultural drainage and refinery effluent. In evaluating drainage options, Reclamation should consider the cumulative effects of disposal of additional selenium and other constituents in downstream habitats, including the Delta.

Ocean Disposal Alternative: The ocean disposal alternative describes the size of a mixing zone where a 15 ppb selenium target will be met at the edge of the zone. As with the Delta Disposal Alternative, a selenium target at the edge of a mixing zone is not relevant to the environmental impacts of selenium. This is because mixing zones are primarily intended to address acute toxicity and their use is inappropriate for bioaccumulative substances like selenium. The total load of selenium discharged into the system is a relevant discussion point not included in the *Plan Formulation Report*. We currently do not have information regarding marine environmental effects from a short- or long-term selenium plume exposure to marine plants or animals. The area of influence is certainly larger than the projected mixing zone size where 15 ppb selenium will be met at the edge of the zone. Biological monitoring, with contingency plans to cease discharges if unacceptable adverse effects are encountered, must be included as an adverse effect avoidance measure.

Applicable Selenium Standards and Criteria: For all the ocean and Delta disposal alternatives the applicable state and Federal numeric water quality criteria cited by Reclamation (15 and 5 ug/L selenium) are unlikely to be the most restrictive criteria. The most restrictive criterion will be the narrative criterion that prohibits discharge of any substance in "toxic amounts", regardless of whether numeric criteria are being met. Reports released by USGS and the San Francisco Regional Water Quality Control Board have clearly indicated that within the San Francisco Bay/Estuary even 0.1 to 0.3 ug/L selenium in the water column is associated with bioaccumulation of selenium in bivalve, waterfowl, and fish tissues at levels exceeding widely accepted toxicity guidelines.

### **Ecological Monitoring and Mitigation**

We believe all alternatives put forward in the *Plan Formulation Report* would require extensive ecological monitoring programs on approximately the same scale as that necessary for the Kesterson Program, Grassland Bypass Project, and the CVPIA Land Retirement Demonstration Program.

Ocean and Delta disposal alternatives will require ecological monitoring of receiving waters. Reclamation acknowledges that toxic effects could be caused by proposed Delta discharges (USBR 2002:6-20). We believe monitoring programs to document the presence or absence of potential toxic effects must be formulated. Additionally, a mitigation contingency plan should be

formulated to anticipate the possible detection of toxic effects. A plan for monitoring mitigation performance would need to be developed should mitigation be necessary. Finally, ocean and Delta disposal alternatives would likely require extensive environmental sampling and research prior to obtaining a discharge permit.

The in-valley alternative will require long-term ecological monitoring of the evaporation ponds and the mitigation sites. While Reclamation briefly acknowledges these needs (USBR 2002: 5-31, 6-21, 6-22), there has been no indication that any monitoring plans have been formulated. Specific monitoring plans should be formulated and the results presented for agency and public review. Because of the large size of the proposed evaporation ponds, monitoring plans must anticipate the potential for local (on-site) as well as landscape scale effects and must address a full spectrum of chemical toxicity (more than just selenium, e.g. boron), epizootic risks (e.g., botulism), physical risks (salt encrustation of waterbirds), and operational risks (incidental to pond operation and maintenance activities). Also, monitoring plans must anticipate risks to on-site resident breeding birds, wintering birds, and spring/fall migrant populations.

For all the proposed alternatives, we believe ecological monitoring will be required for the extensive acreages of drainage reuse facilities. The *Plan Formulation Report* fails to acknowledge the need for, and extent of, potential mitigation and mitigation performance monitoring. Monitoring for reuse areas will have to anticipate potential risk pathways from both the application of reuse drainage water and the shallow groundwater storage of drainage at less than 7 feet below ground surface. Again, the large size of the reuse facilities means that monitoring will have to anticipate the potential for both local (on-site) as well as landscape scale effects. The monitoring plan will also have to anticipate contingencies for adaptively responding to episodic events (such as severe individual storms or severe "El Nino" seasons) that could result in ephemeral surface pooling of water over large areas of the reuse sites (as has been documented for individual storms at Red Rock Ranch and severe "El Nino" seasons at Kesterson Reservoir). The monitoring plan will have to accommodate the qualitatively different needs for both terrestrial and aquatic ecosystem monitoring and potential mitigation. Reclamation should also explicitly state what the anticipated monitoring needs (if any) might be for the equalization basins at the treatment facilities. Unlike the anoxic ponds, it was not stated whether the equalization basins would be covered. The formulated monitoring plans and mitigation contingencies should be presented for agency and public review.

The environmental effects of San Joaquin Valley drainwater disposal are thoroughly documented in many publications. Included in a long list of reports is *Effects of irrigation drainwater contaminants on wildlife* (Moore et. al. 1990). Any San Luis Unit drainwater or salt disposal action(s) would require substantial environmental mitigation and biological monitoring investments.

In 1995, the Service developed evaporation pond mitigation and compensation protocols that were provided to Reclamation in February 2002. For several reasons, these protocols may not directly apply to the plan formulation process:

- The protocols have only been applied to smaller ponds (700 acres or less). Without further analysis of potential bird use, landscape effects, location, effectiveness of bird discouragement measures, etc., the Service does not know if the protocols would apply to the larger (>2,000 acres) evaporation ponds proposed by Reclamation;

- The protocols considered only selenate-dominated drainage water. The proposed algal-bacterial selenium treatment results in effluent containing selenium in more bioavailable forms (e.g., selenite and organo-selenium). *Amweg et al.* (2003) noted that selenite and organic selenium accounted for 37 percent of the total selenium in algal-bacterial selenium reduction treated effluent. Selenite and organic selenium are known to be more toxic and more bioavailable than selenate resulting in two to four times higher selenium concentrations in invertebrates living in the treated water than the untreated water. The authors further noted that bioavailability, as measured by Biological Concentration Factors, increased two to ten times after treatment as well; and
- The protocols focused primarily on mitigating reproductive effects on two species of shorebirds (black-necked stilts and American avocets). They do not address the effects on wintering or migrating waterfowl and other migratory birds, effects of salt encrustation of feathers of birds using the ponds, reproductive effects on nesting waterfowl, or the secondary effects on predators of birds that use the ponds such as the peregrine falcon.

The Service strongly believes the protocols should be updated to reflect new data that has become available since 1995 (the date of the protocols).

We believe the *Mitigation Requirements Related to Evaporation Ponds in the San Joaquin Valley of California, Draft White Paper*, July, 2002 and the *Draft Alternatives Report* do not provide sufficient information to make an informed decision on the use of evaporation ponds for drainage water reduction. On February 25, 2002, the Service provided an evaporation pond analysis, *San Luis Unit Drainage Re-evaluation - Evaporation Ponds*, which included mitigation, monitoring, and cost information that should be included in a revised "White Paper" and the EIS. Our evaporation pond summary identified costs could be in the billions of dollars over a 50-year project life expectancy. The commitment of evaporation pond management, mitigation, and monitoring should be fully disclosed and evaluated so as to provide equal consideration for fish and wildlife resources.

The *Plan Formulation Report* indicates that evaporation pond mitigation similar to the Tulare Lake Drainage District's (TLDD) mitigation facility would be adopted. The Service recommends that before Reclamation adopts the TLDD mitigation model a study be conducted at the TLDD mitigation wetlands to confirm whether those wetlands actually provide reasonable rates of recruitment of young birds into adult populations. Although TLDD's wetlands do attract high densities of nesting shorebirds and have high rates of egg hatch, it has not been demonstrated that post-hatch conditions are sufficient to facilitate juvenile recruitment into the adult population. This would require a banding and/or telemetry study. The high density of nesting birds (with attendant territorial aggression toward each other's hatchlings) and the lack of substantive vegetative cover (important to hatchlings) might both tend to cause high hatchling mortality and/or forced movement off-site (the risks of which would depend on the surrounding landscape). In short, the Service fears the TLDD mitigation design may not provide the mosaic of habitats favorable for successfully completing the full reproductive cycle (i.e., carrying hatchlings all the way through to recruitment into adult populations). This uncertainty should be addressed with direct collection of relevant data prior to irrevocably committing all or a substantial portion of San Luis Unit evaporation pond mitigation to the TLDD design. Also, at the unprecedented scale of the proposed San Luis Unit evaporation ponds, it should be evaluated whether a mitigation design that largely addresses only shorebird mitigation (such as TLDD's design) is appropriate. The ratio of shoreline to total pond area goes down as the size of an

evaporation pond is scaled upward, and the relative importance of toxic risks to shorebirds versus waterbirds that favor deeper water may shift substantively. TLDD's biological monitoring reports suggest that just by changing the nature of the shoreline (steep-sided levees) such a shift has already occurred.

Reclamation should provide more details of the size of the TLDD-like mitigation because it is unclear whether the TLDD fencing system can be designed to minimize negative effects and ensure effectiveness without prohibitive costs. The TLDD's electric fence has been documented to cause death by electrocution of amphibians (such as toads). The fence is a highly attractive pupation and resting surface for invertebrates emerging from the wetlands which may largely explain why some electrocuted toads were suspended from the fence by their tongues. On the scale of thousands of acres, rather than a couple hundred acres, and depending on the surrounding landscape and the presence or absence of listed species, it could prove not only to be very expensive, but also a very ecologically unwise proposition to have an electrified fence spanning several linear miles around wetland habitat. Additionally, there is the potential for accidental human contact with the fence that needs to be evaluated (again depending on the nature of the surrounding landscape). An assessment of any crucial differences in the potential make-up of nest predators in the upper San Joaquin Valley versus the Tulare Basin should be done to determine if an electrified fence is more or less effective in the San Luis Unit. Finally, if a large area is to be fenced, there is the potential for enclosing predators as well as excluding them.

It is explicitly stated in the *Plan Formulation Report* that operation of evaporation ponds would be more likely to impact aquatic and wetland species/habitats than terrestrial species/habitats (USBR 2002:7-6). However, Reclamation is proposing that up to 50 percent of mitigation for proposed evaporation ponds be in the form of terrestrial habitats. We believe the overwhelming proportion (80 to 90 percent, minimum) of mitigation for proposed evaporation ponds should be in the form of aquatic and wetland habitats. Additional mitigation needs for adverse effects at drainage reuse facilities (which were not addressed in the *Plan Formulation Report*) may require a high proportion of terrestrial habitat.

For a complete evaluation of any of the alternatives, we believe Reclamation should convene a mitigation and monitoring workshop with the Service, the San Francisco Bay and Central Valley Regional Water Quality Control Boards, and other interested parties with appropriate technical expertise as soon as possible. We believe without such a workshop (ideally including fully updated mitigation protocols) cost estimates for any alternative would be speculative, and for the reasons stated above, almost certainly and substantively are underestimated.

## **Endangered Species**

The Endangered Species Act (ESA) requires the Service to use its authority in furtherance of the purposes of this Act. In acknowledgment and support of that approach, we remind you to complete consultation under section 7 of the ESA prior to finalizing a selected alternative to implement actions to provide drainwater service and disposal. Consultation under section 7 is required for all Federal actions (including planning actions) that may result in effects on federally listed species or their designated critical habitat. Due to the extraordinary workload anticipated from Reclamation in calendar year 2003, the Service recommends that Reclamation initiate section 7 consultation on the San Luis Unit Feature Re-evaluation after February 2004. This is

consistent with the time line for public/agency comment for this planning effort that was provided at the public meetings in January 2003.

### Miscellaneous Issues

Ecotoxicological value of biological treatment: The *Plan Formulation Report* assumes that biological treatment of effluent from the reuse facilities would reduce the selenium content of the drainage water by 80 percent and thereby the ecotoxicity of the water by a comparable degree. However, *Amweg et al.* (2003) recently reported in detail that selenium removal based on biological processes will result in the production of selenoproteins that result in treatment effluent water being more toxicologically harmful than the untreated influent. Reuse drainwater flowing into the algae-bacterial treatment system is estimated to have around 392 ppb selenate while the treatment system will discharge around 48 ppb selenate and 28 ppb selenite and organoselenium. However, our analysis of *Amweg et al.* (2003) data along with bioaccumulation factors calculated from Tulare Basin evaporation ponds shows that the treatment water discharged into evaporation ponds would be the toxic equivalent of 1,400 to 3,000 ppb selenate (Attachment B). Thus, it is possible that money allocated to treatment in Reclamation's various alternatives would actually worsen the environmental performance of the project, not improve it. Should this prove to be the case for the particular biological treatment favored by Reclamation, it will have an enormous effect on the amount of mitigation required for evaporation ponds (possibly raising mitigation requirements by an order of magnitude or more). The *Plan Formulation Report* was silent on this issue. We recommend full analysis of issues raised in *Amweg et al.* (2003) be included in the EIS for this project. If biological treatment would have to be abandoned, then size of evaporation ponds and mitigation requirements would need to be re-evaluated along with the costs for mitigation (both of which would increase enormously).

Verification of flow-weighted averages: The Service was unable to derive the flow weighted averages for water quality characteristics presented in Tables 3.4-1 and 3.4-2 using the flows presented in Table 3.3-1b. For example, Table 3.4-1 reports a flow-weighted average for boron of 8,488 mg/L, while using the flows presented in Table 3.3-1b the Service calculates the flow-weighted average for boron in Table 3.4-1 at 10,966 mg/L. The Service recommends that in the EIS, influent and effluent water quality characteristics be estimated and reported separately for each of the four proposed drainage reuse facilities. A substantive range of variation may exist that is masked by overall composite averages.

False Precision of Cost Criterion: The estimated costs of the alternatives put forth in the *Plan Formulation Report* vary from approximately \$0.95 to \$1.2 billion. Yet, the cost uncertainties cited throughout the report are large. Reclamation explicitly states that the cost estimates for each complete alternative carry a level of uncertainty that needs to be accounted for and places that level of uncertainty at about +/- 30 percent (USBR 2002:C-1). Consequently, all the alternatives must be viewed as essentially indistinguishable on the basis of cost. The Service believes that a land retirement alternative might prove to be the superior choice from all other alternatives on the basis of cost, and certainly would be the clearly superior environmental alternative.



## RECOMMENDATIONS

We submit the following recommendations to assist your planning and alternatives development processes and to avoid and minimize impacts to fish and wildlife resources:

1. Increase the focus of project-related alternatives to allow for emphasis in avoidance of adverse environmental effects, and to recognize and align with other directives and mandates that are providing environmental restoration mitigation and enhancement in California's Central Valley and Central Coast areas, including the CVPIA, CALFED, SJVDP, ESA, Migratory Bird Treaty Act, and Clean Water Act.
2. Include a range of land retirement and fallowing options in alternatives that focus on management and elimination of the need for drainage service, including at least the following: (1) land retirement of all drainage impacted lands, and (2) land retirement implemented in concert with a suite of other drainage reduction, treatment and disposal techniques, as recommended in the SJVDP's *Rainbow Report*.
3. Include demand and supply management options in addition to those identified in the existing alternatives. This would reduce the need for drainage reduction while improving the quantity and quality of water supplies for all Valley needs, including fish and wildlife. These options should include: (1) evaluation and inclusion of non-interceptor drain solutions; (2) increased emphasis on dry-land farming and/or non-irrigated grazing practices; (3) extensive on-farm drainage source control; (4) appropriate post land retirement/fallowing water contract modifications; and (5) development of an out of basin water transfer "water sharing" policy, taking into account the CALFED concept of sharing benefits equally, and supported by the CVPIA concept that fish and wildlife uses are equal to agricultural and municipal and industrial uses for project water (CVPIA, Sec. 3406 (a)(1)).
4. Update, with the Service's assistance, mitigation, compensation, and monitoring protocols for evaporation pond and reuse areas.
5. Convene as soon as possible, a mitigation and monitoring workshop with the Service, the San Francisco Bay and Central Valley Regional Water Quality Control Boards, and other interested parties with appropriate technical expertise.
6. Include, to the extent Reclamation provides drainage service, reconfiguration of pre-existing Delta-Mendota Canal drainage systems to the Reclamation-planned drainage service facilities.
7. Include an appropriate level of biological monitoring so as to identify unacceptable adverse environmental effects.
8. Include, for all alternatives, contingency plans that would eliminate drainage discharges if unacceptable adverse environmental effects were identified.
9. Evaluate any proposed biological treatment system, not only on the basis of how much selenium it removes from water, but also on the net ecotoxicological effect of the

treatment process as per *Amweg et al.* (2003). This should preclude adoption of any process that actually increases net ecotoxicological risk, such as Algal Bacterial Selenium Reduction [ABSR] treatment.

10. Initiate section 7 consultation on the San Luis Unit Feature Re-evaluation after February 2004 due to extraordinary Reclamation-related workload in calendar year 2003.
11. Modify FWCA language in the *Draft Alternatives Report*, page 3-87, *Plan Formulation Report*, page F-4, and any subsequent report to read, "The Fish and Wildlife Coordination Act (P.L. 85-624) requires Federal agencies proposing water resource development projects, or involved in issuance of related permits or licenses, to consult with the Service and provide equal consideration to the conservation, rehabilitation, and enhancement of fish and wildlife resources with other project purposes."
12. Consider and appropriately include items identified in Attachment C.

#### SUMMARY

The Service believes Reclamation's current suite of alternatives for the San Luis Drain Feature Re-Evaluation Plan unnecessarily confines the scope of alternatives to drainage service options. We believe these alternatives must include equal consideration of fish and wildlife resources, and as such, should seek to avoid or minimize environmental affects by focusing, as much as possible, on the elimination of the need for drainage service. We recommend including a full range of water demand and supply management options, like land retirement and land fallowing, in your San Luis Drain Feature Re-Evaluation solution.

We believe Reclamation, in its efforts to solve San Luis Unit drainage issues, should fully consider and include mandates and directives as provided under the Central Valley Project Improvement Act, the CALFED Bay/Delta Program, the Endangered Species Act, the Clean Water Act, and the Migratory Bird Treaty Act. By focusing on long-term, sustainable ecosystem values, we believe Reclamation would be better able to balance water supply with demand, provide for truly sustainable agriculture and improved water quality, while increasing the quantity and quality of San Joaquin Valley habitat, possibly providing for the recovery of numerous listed species, and the protection of millions of migratory birds.

It is our goal to provide meaningful FWCA-related recommendations to the San Luis Drain Feature Re-Evaluation Plan effort so as to assist Reclamation's provision of an equal consideration of conservation, rehabilitation, and enhancement of fish and wildlife resources with other project purposes. Additionally, we look forward to working with Reclamation in this challenging endeavor under our numerous other authorities and responsibilities. This memorandum was completed as a result of joint coordination by the divisions of Habitat



Conservation, Environmental Contaminants, and Endangered Species in the Sacramento Fish and Wildlife Office. Questions regarding this memorandum can be directed to Mark Littlefield at 916-414-6581.

#### Attachments

cc:

AES, Portland, OR

California/Nevada Office, Fish and Wildlife Service, Sacramento, CA

William Luce, Area Manager, Bureau of Reclamation, Fresno, CA

Alan Candlish, Division of Planning, Bureau of Reclamation, Sacramento, CA

Jason Phillips, Division of Planning, Bureau of Reclamation, Sacramento, CA

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## **ATTACHMENT A**

### **Project Activity Statement**

**Prepared for:** Project Files

**Submitted:** July 8, 2003

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**TITLE:** San Luis Drainage Feature Re-Evaluation Project

#### **ACTIONS:**

- September 17, 2001 - Mark Littlefield and Marla Maccoubrie of the Service negotiated a Scope of Work with Patricia Roberson and Jason Phillips of Reclamation.
- October 2001 - Received and reviewed the draft EIS work plan
- October 25, 2001 - Alternatives Planning Team meeting participation. Discussed the project purpose statement.
- November 5, 2001 - Participated in the Team Coordination Meeting
- November 15, 2001 - Attended a Public Scoping Meeting in Concord
- December 2001 - Received and reviewed the Preliminary Alternatives Report.
- December 6, 2001 - Participated in the Team Coordination Meeting
- January 10, 2002 - Participated in the Team Coordination Meeting
- January 15, 2002 - Submitted a Planning Aid Memorandum for the project
- February 27, 2002 - Provided the evaporation pond work group with a brief describing pond design, mitigation, compensation, and cost.
- March 5, 2002 - Attended an Agency Workshop to discuss the project purpose and the preliminary alternatives.
- April 4, 2002 - Participated in the Team Coordination Meeting
- July 2002 - Received a Draft White Paper on Mitigation Requirements Related to Evaporation Ponds in the San Joaquin Valley
- September 10, 2002 - Participated in an Interagency Workshop
- September 10, 2002 - Participated in the interagency meeting, discussed alternatives and land retirement options.
- November 4, 2002 - Reclamation requested Cooperating Agency Status
- December 2002 - Received and reviewed the Plan Formulation Report
- December 5, 2002 - Accepted Cooperating Agency Status
- December 17, 2002 - Submitted comments on meeting notes.
- February 26, 2003 - Requested a public comment period time extension.
- April 2003 - Provided the draft Planning Aid Memo for Reclamation review and comment.
- June 2003 - Prepared an authors draft Coordination Act report
- June 6, 2003 - Continued participation in mitigation analysis workshop conferences

#### **Project Team:**

Fish and Wildlife Service: Mike Hoover, Mark Littlefield, Joy Winckel, Joe Skorupa, Tom Maurer, Bill Beckon, and John Brooks



## Comparative bioavailability of selenium to aquatic organisms after biological treatment of agricultural drainage water

E.L. Amweg<sup>a,\*</sup>, D.L. Stuart<sup>b</sup>, D.P. Weston<sup>a</sup>

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Received 16 January 2002; received in revised form 15 July 2002; accepted 17 July 2002

### Abstract

Selenium (Se) is naturally abundant in the soils of the western San Joaquin Valley, California, USA. Intense agricultural activity in this region requires irrigation which leaches Se into surface waters draining to the San Joaquin River. Se water contamination and subsequent accumulation in wildlife is a serious problem in the Central Valley of California, and the subject of increasingly intensive regulatory action. Algal–bacterial selenium reduction (ABSR) is a potential new treatment approach to reduce Se in agricultural drainage, and an ABSR demonstration facility was examined with respect to its Se removal efficiency and effect on Se bioavailability and bioaccumulation. Water samples were taken to study treatment effects on Se speciation. Invertebrate tissue Se concentrations in the ABSR ponds were monitored for 2 years. Laboratory-based algal bioaccumulation tests and *in situ* microcosms with a variety of invertebrates were also used to address differences in Se bioavailability before and after ABSR treatment. The ABSR system removed about 80% of the total influent Se; however, microbial and algal activity produced selenite and organic Se, the combined concentration of which increased 8-fold during treatment. As a result of the greater bioavailability of selenite and organic Se, relative to the selenate of the influent, treatment contributed to greater Se concentrations in effluent-exposed organisms. ABSR-treated water produced Se concentrations in biota 2–4 times greater than organisms exposed to untreated water. The bioavailability of Se in the treated water was 2–10 times greater than Se in the influent. The shift to more bioavailable Se forms due to biological treatment is inherent in system design, and makes it difficult to weigh the ecological benefits of a reduction in total Se loadings from a regional perspective against the greater toxicological risk to biota in the vicinity of the effluent.

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**Keywords:** Selenium; Bioavailability; Speciation

### 1. Introduction

Selenium (Se) is a semi-metallic element found naturally in high concentrations in the soils of the western San Joaquin Valley, California (Losi and Frankenberger, 1997a). Agricultural activity in

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## **Algal-Bacterial Selenium Reduction (ABSR)**

**Toxic Equivalency Calculations (based on data in Amweg et al. 2003):**

**Start w/ 392 ug/l selenate**

**End up with 48 ug/l selenate and 28 ug/l reduced Se (total Se of 76 ug/l) after ABSR including DAF and SSF.**

### **Bioaccumulation:**

**Worms - start out with 25 ug/g dw; end up with 51.4 ug/g dw Se (ratio of ca. 2X).**

**Snails - start out with 17.3 ug/g dw; end up with 47.1 ug/g dw Se (ratio of ca. 2.7).**

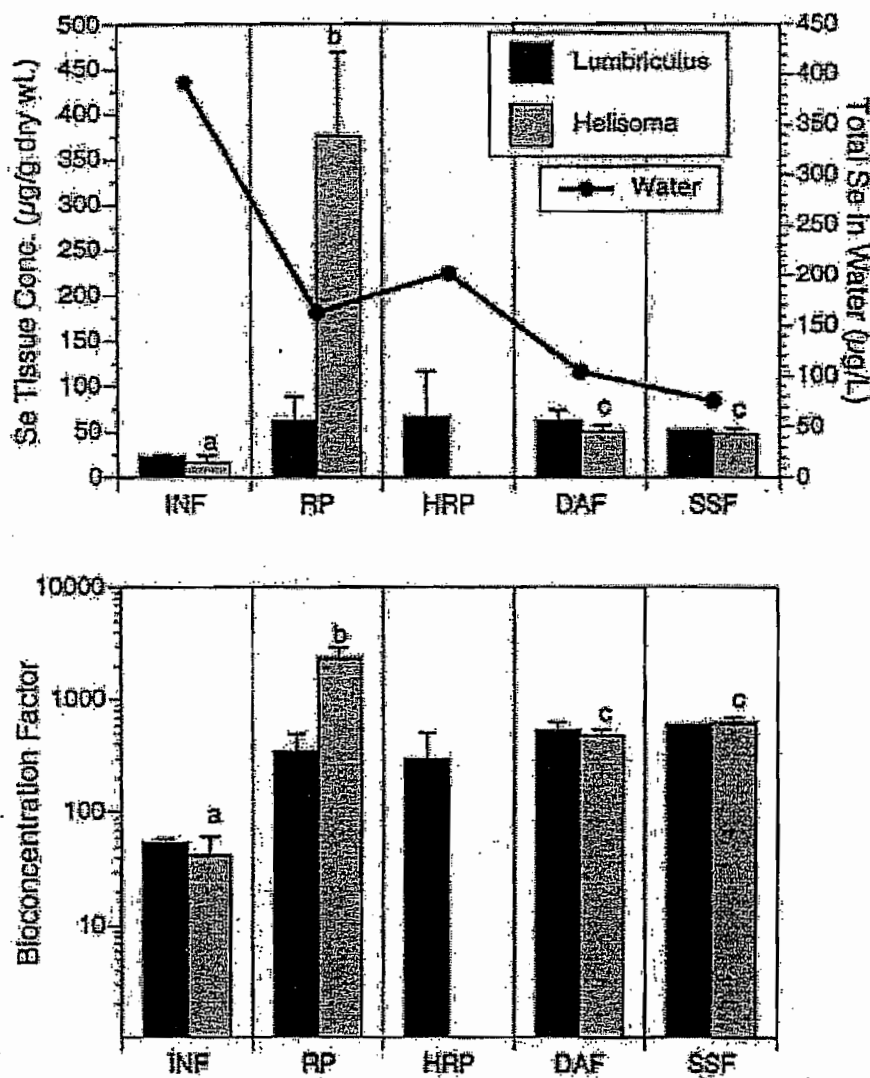
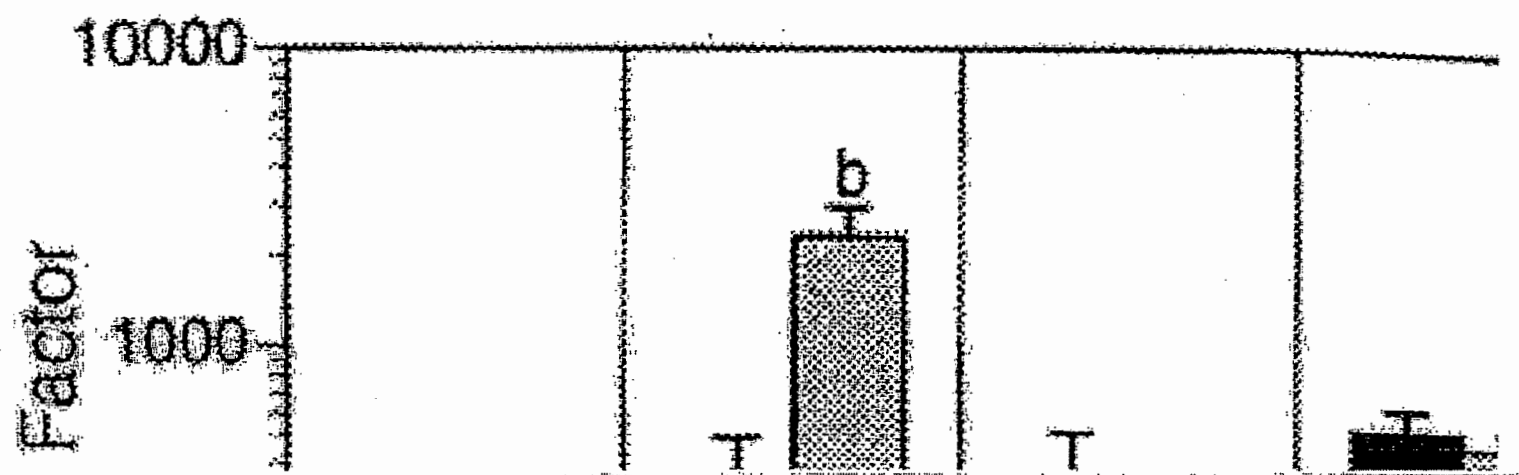
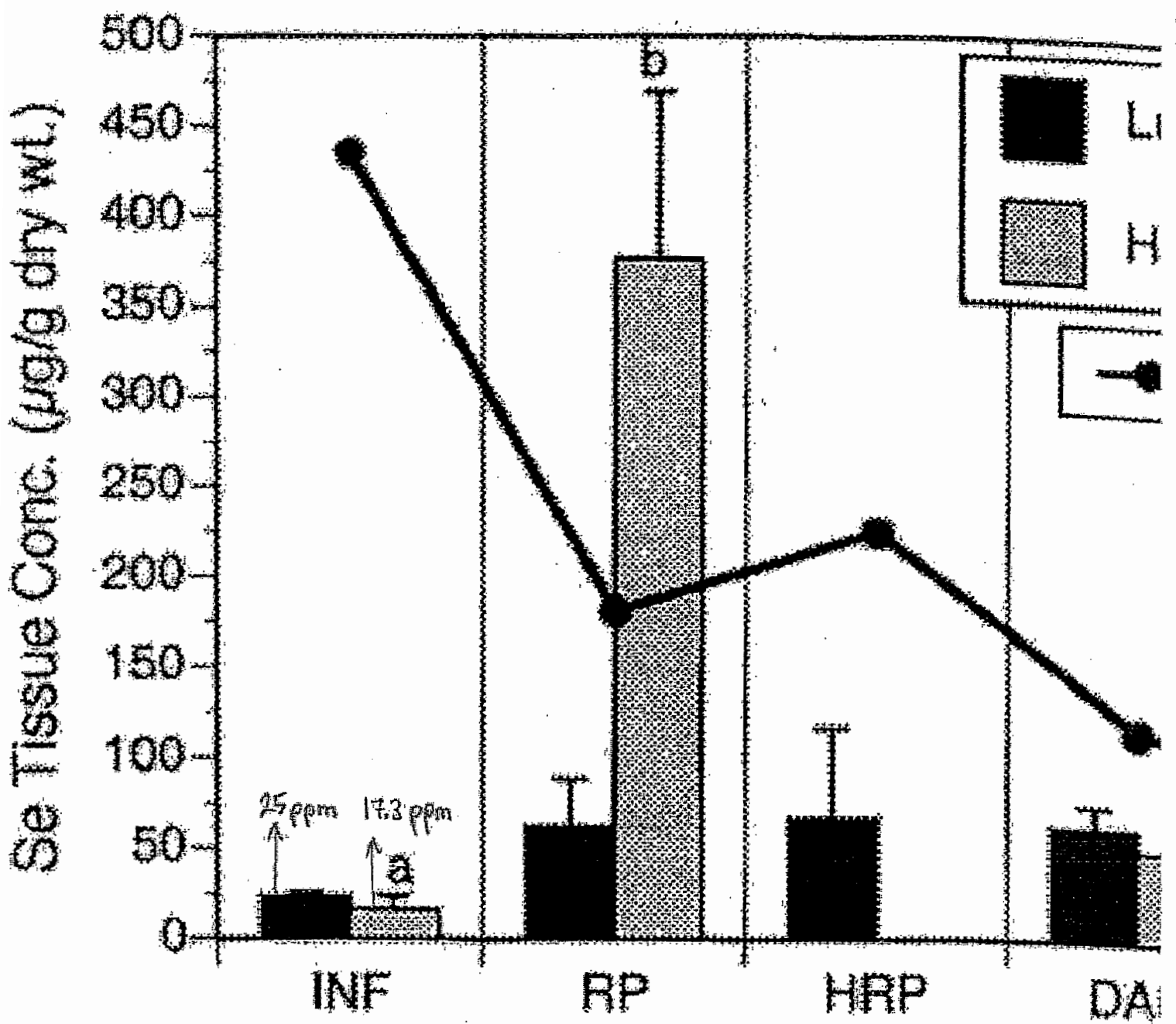


Fig. 7. Total Se concentrations and BCFs in microcosm invertebrates after 30 days in situ exposure to ABSR system water. Means and standard deviations are shown, with  $n$  usually equal to 3. Significant differences among the treatments, based on Conover's multiple comparison test ( $P < 0.05$ ) are designated by letter symbols. Average water Se concentrations at each step in the system throughout the exposure period are shown as a line in the first panel. No *Helisoma* sp. were recovered from the HRP microcosm.

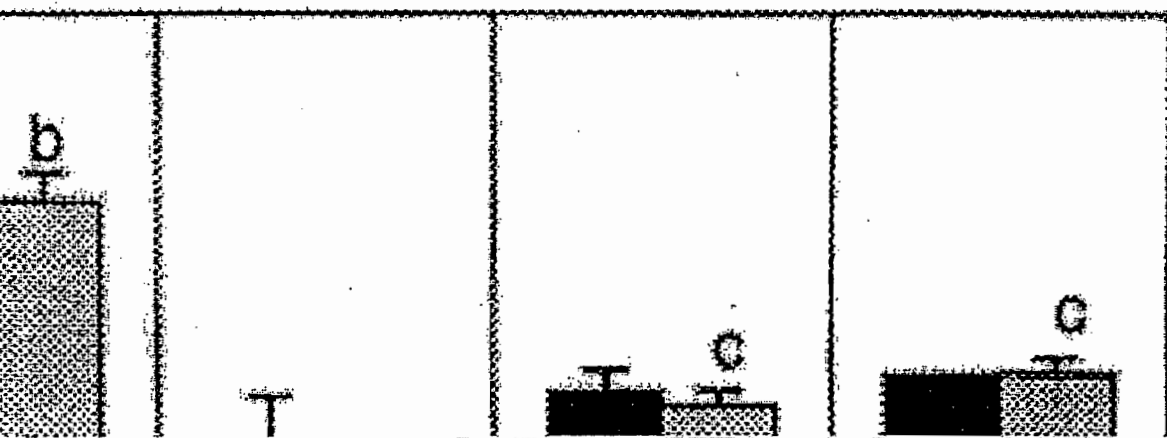
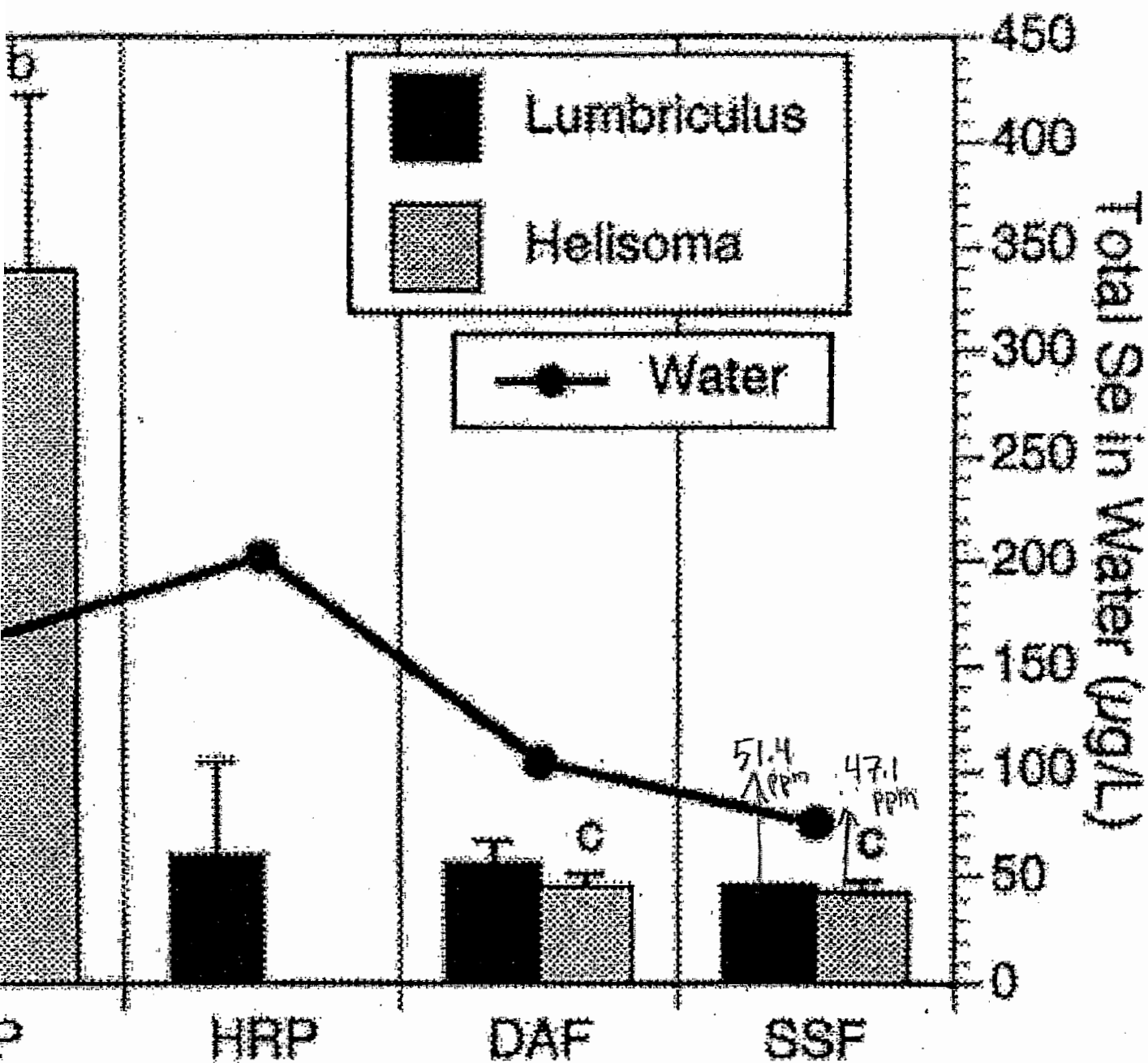
for chronic exposures, but well without ABSR.

While total Se was reduced by ABSR, it was also shifted to various Se species. While total Se was present in all forms from < 100 µg/L in RP water in the HRP treatment, the activity of the organic species was removed of a proportion of the Se, but the final ABSR showed that the sediment created a particulate form of Se. The Se formed from the reoxidation of Se is then be present in the water column.

Results indicate that the ABSR system reduced the untreated algal bioaccumulation of Se more than 10-fold.







Assuming simple linear bioaccumulation curves, the selenate toxic equivalency of ABSR product water would be 784-1,058 ug/l.

But curves are not linear, bioaccumulation factors are a diminishing returns function of magnitude of exposure.

Nonlinear curves estimated from Tulare Basin evaporation pond data for 4 taxa by CDWR in late 1980's.

Using log-log linear regression, BAF exponents (slopes) ranged from 0.49 - 0.62 for corixids, brine shrimp, damselflies, and midge larvae.

Using this range for CDWR's exponents (0.49-0.62) and constants fitted to observed results of 25 ug/g and 17.3 ug/g dw Se in worms and snails from 392 ug/l selenate water..... equations for more precisely estimating selenate toxic equivalency are derived:

**$\text{Log (Worm Se, ppb dw)} = 3.13 + 0.49 \text{ Log (water selenate equivalency, ppb)}$**

**$\text{Log (Worm Se, ppb dw)} = 2.79 + 0.62 \text{ Log (water selenate equivalency, ppb)}$**

**$\text{Log (Snail Se, ppb dw)} = 2.97 + 0.49 \text{ Log (water selenate equivalency, ppb)}$**

**$\text{Log (Snail Se, ppb dw)} = 2.63 + 0.62 \text{ Log (water selenate equivalency, ppb)}$**

**Solving for Worm tissue of 51.4 ug/g dw = 1,870 ug/l and 1,362 ug/l**

**Solving for Snail tissue of 47.1 ug/g dw = 2,989 ug/l and 1,973 ug/l**

**Thus, the ABSR system Amweg et al. monitored took water with a selenate toxic equivalency of 392 ug/l and transformed it to water with a selenate toxic equivalency of roughly 1,400-3,000 ug/l .**

The goal of the U.S. Fish and Wildlife Service is to conserve, protect and enhance fish, wildlife, and their habitats by timely and effective provision of fish and wildlife information and recommendations. To assist us in accomplishing this goal, we would like to see the items described below addressed in your environmental documents for the proposed project.

### **Project Description**

The document should very clearly state the purposes of, and document the needs for, the proposed project so that the capabilities of the various alternatives to meet the purposes and needs can be readily determined.

A thorough description of all permanent and temporary facilities to be constructed and work to be done as a part of the project should be included. The document should identify any new access roads, equipment staging areas, and gravel processing facilities which are needed. Figures accurately depicting proposed project features in relation to natural features (such as streams, wetlands, riparian areas, and other habitat types) in the project area should be included.

### **Affected Environment**

The document should show the location of, and describe, all vegetative cover types in the areas potentially affected by all project alternatives and associated activities. Tables with acreage of each cover type with and without the project for each alternative would also be appropriate. We recommend that all wetlands in the project area be delineated and described according to the classification system found in the Service's Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). The Service's National Wetland Inventory maps would be one starting point for this effort, but updated information may be needed.

The document should present and analyze a full range of alternatives to the proposed project. In an effort to fully comply with the Clean Water Act and meet the Federal government's goal of no net loss of wetlands, at least one alternative should be designed to avoid all impacts to wetlands, including riparian areas. Similarly, within each alternative, measures to minimize or avoid impacts to all habitats (wetlands, riparian areas, grasslands, oak woodlands, etc.) should be included.

Lists of fish and wildlife species expected to occur in the project area should be in the document. The lists should also indicate for each species whether it is a resident or migrant, and the time of year it would be expected in the project area.

### **Environmental Consequences**

The sections on impacts to fish and wildlife should discuss impacts from vegetation removal (both permanent and temporary), filling or degradation of wetlands, interruption of wildlife migration corridors, and disturbance from trucks and other machinery during construction and/or operation. These sections should also analyze possible impacts to streams from construction of outfall structures, pipeline crossings, and filling. Impacts on water quality, including nutrient

loading, sedimentation, toxins, biological oxygen demand, and temperature in receiving waters should also be discussed in detail along with the resultant effects on fish and aquatic invertebrates. Discussion of indirect impacts to fish, wildlife, and their habitats, including impacts from growth induced by the proposed project, should also be addressed in the document. The impacts of each alternative should be discussed in sufficient detail to allow comparison between the alternatives.

The cumulative impacts of the project, when viewed in conjunction with other past, existing, and foreseeable projects, needs to be addressed. Cumulative impacts to fish, wildlife and habitats, including water quality, should be included.

### **Mitigation Planning.**

Under provisions of the Fish and Wildlife Coordination Act, the Service advises and provides recommendations to Federal agencies planning water development activities or permitting such activities. These Federal agencies are to consult with the Service and give equal consideration to the conservation and rehabilitation of fish and wildlife resources with other project purposes. When reviewing proposed activities, the Service generally does not object to projects meeting the following criteria:

1. They are ecologically sound;
2. The least environmentally damaging reasonable alternative is selected;
3. Every reasonable effort is made to avoid or minimize damage or loss of fish and wildlife resources and uses;
4. All important recommended means and measures have been adopted, with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal; and
5. For wetlands and shallow water habitats, the proposed activity is clearly water dependent and there is a demonstrated public need.

The Service may recommend the "no project" alternative for those projects which do not meet all of the above criteria, and where there is likely to be a loss of fish and wildlife resources.

When projects impacting fish and wildlife resources are deemed acceptable to the Service, we recommend full mitigation for any impacts to fish and wildlife habitat. The Council on Environmental Quality regulations for implementing the National Environmental Policy Act define mitigation to include: 1) avoiding the impact; 2) minimizing the impact; 3) rectifying the impact; 4) reducing or eliminating the impact over time; and 5) compensating for impacts. The Service supports and adopts this definition of mitigation and considers the specific elements to

represent the desirable sequence of steps in the mitigation planning process. Accordingly, we maintain that the best way to mitigate for adverse biological impacts is to avoid them altogether.

Project documentation should include a mitigation plan that describes all measures proposed to avoid, minimize, or compensate for impacts to fish and wildlife and their habitats. The measures should be presented in as much detail as possible to allow evaluation of their probable effectiveness.

To determine mitigation credits available for unavoidable impacts, future conditions on the mitigation site, absent any mitigation, are estimated and then compared to conditions expected to develop as a result of implementing the mitigation plan.

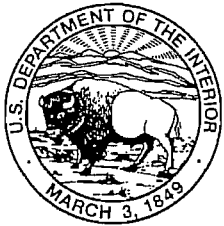
Mitigation habitat should be equal to or exceed the quality of the habitat to be affected by the project. Baseline information would need to be gathered at the impact site to be able to quantify this goal, such as plant species diversity, shrub and tree canopy cover, number of stems per acre, tree height, etc. Judging the ultimate success of the project should include success of mitigation, which should use these same measurements at the mitigation site as standards of comparison. Mitigation success criteria should aim toward equaling or exceeding the quality of the highest quality habitat to be affected. In other words, the mitigation effort would be deemed a success in relation to this goal if the mitigation site met or exceeded target habitat measurements (plant cover, density, species diversity, etc.).

Criteria should be developed for assessing the progress of mitigative measures during their developmental stages as well. Assessment criteria should include rates of plant growth, plant health, and evidence of natural reproduction.

The plan should present the proposed ground elevations at the mitigation site, along with elevations in the adjacent areas. A comparison of the soils of the proposed mitigation and adjacent areas should also be included in the plan, and a determination made as to the suitability of the soils to support habitats consistent with the mitigation goals.

Because of their very high value to migratory birds, and ever-increasing scarcity in California, our mitigation goal for wetlands (including riparian and riverine wetlands) is no net loss of in-kind habitat value or acreage, whichever is greater. As a result of their high value and reliance on suitable hydrological conditions, wetlands require development of additional information on the predicted hydrology of the mitigation site. The plan should describe the depth of the water table, and the frequency, duration, areal extent, and depth of flooding which would occur on the site. The hydrologic information should include an analysis of extreme conditions (drought, flooding) as well as typical conditions.

A mitigation plan must include a timeframe for implementing the mitigation in relation to the proposed project. We recommend that mitigation be initiated prior to the onset of construction. If there will be a substantial time lag between project construction and completion of the



## United States Department of the Interior

### FISH AND WILDLIFE SERVICE


Sacramento Fish and Wildlife Office  
2800 Cottage Way, Room W-2605  
Sacramento, California 95825-1846

REPLY TO ATTENTION TO:

JUL 15 2003

### Memorandum

**To:** Regional Director, U.S. Bureau of Reclamation,  
Sacramento, California

**From:**   
Acting Field Supervisor, Sacramento Fish and Wildlife Office,  
Sacramento, California

**Subject:** National Environmental Policy Act Comments on the San Luis Drainage Feature  
Re-Evaluation Plan

This memorandum transmits U.S. Fish and Wildlife Service (Service) comments on the U.S. Bureau of Reclamation's (Reclamation) San Luis Drainage Feature Re-Evaluation Plan and associated *Draft Alternatives Report*, dated October 4, 2002. The Service provides these comments under authority of, and in accordance with, provisions of the National Environmental Policy Act (NEPA)(40 CFR Part 1500), our role as a Cooperating Agency under NEPA (as identified on Attachment A), and within associated guidance from the President's Council on Environmental Quality (including Attachment B). We believe the Service's role of cooperator is to assist Reclamation in its identification of issues which are germane to any subsequent action it must take on the proposed action, to identify significant issues early, to provide for better decision making, and to avoid possible legal challenges. Our focus is to assist Reclamation in its efforts to "...make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment" (40 CFR Part 1500.1(c)).

Our comments and recommendations are based upon our review of Reclamation's *San Luis Drainage Feature Re-Evaluation Plan Formulation Report* (dated December 2002)(Plan Formulation Report), *Draft Alternatives Report*, *Preliminary Alternatives Report* (dated December 2001), *Draft Work Plan* (dated October 2001) for the *San Luis Drainage Feature Re-Evaluation and Environmental Impact Statement* (Draft Work Plan), the *Functional Analysis Study Workshop Report* (dated August 2001), Interagency Scoping Workshop documents, the San Luis Act (P.L. 86-488, dated 1960), Court of Appeals findings (Case Number 95-15300), *Draft White Paper-Mitigation Requirements Related to Evaporation Ponds in the San Joaquin* (dated July 2002), *A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley* (USDOI and CRA 1990), and other related reports and documents.

**DESCRIPTION OF THE PROJECT**

According to the project's *Draft Work Plan* (USBR 2001), the purpose of the San Luis Drainage Feature Re-Evaluation Plan is "to formulate and implement a plan to provide drainage service to the San Luis Unit of the Central Valley Project (CVP) to achieve long-term, sustainable salt balance in the root zone of irrigated lands." The project reports consistently state its purpose is directed by the Sumner-Peck 2000 lawsuit decision to provide drainage service to the San Luis Unit. To date, this purpose statement is consistent in all associated reports.

The project, as currently envisioned by Reclamation, begins with on-farm and in-district drainage reduction actions that are expected to be adopted by farmers regardless of which ultimate disposal alternative is chosen by the Federal government. Those drainage reduction actions include drainwater recycling, shallow groundwater management, and canal seepage reduction. On-farm and in-district actions would then be followed by the Federal government's actions of drainage collection (from farms), drainage reuse (at four regional reuse facilities), drainage treatment, and disposal. Reclamation estimated that 379,000 acres would be drainage impaired (36,000 of which are outside the San Luis Unit), and that 254,000 acres would actually have drainage systems installed by the year 2050 (the end date of the planning horizon).

After assumed irrigator implemented actions were incorporated, drainage service alternatives were evaluated. These alternatives include the proposed in-valley disposal (evaporation ponds), ocean disposal (Point Estero-Morro Bay), Delta-Chipps Island disposal, Delta-Carquinez Strait disposal, and no action. The major components in each alternative are as follows (USBR 2002):

**Proposed in-valley disposal**

- 26,700 acres of regional reuse facilities
- Reverse osmosis treatment facility in Northerly Area
- 160 acres of selenium treatment facilities
- 5,000 acres of evaporation ponds
- 3,200 to 6,400 acres of mitigation habitat
- Estimated total present worth cost of \$946 million (2002 dollars), with an annual equivalent cost of \$59 million

**Ocean disposal**

- 27,200 acres of regional reuse facilities
- 177 miles of buried pipeline conveyance of drainwater using existing right-of-way when possible, including three tunnels through coastal range and ten pumping plants
- Estimated total present worth cost of \$1.183 billion (2002 dollars), with an annual equivalent cost of \$73.7 million

**Delta-Chipps Island disposal**

- 27,200 acres of regional reuse facilities
- 160 acres of selenium treatment facilities
- Utilizes existing San Luis Drain
- 191 miles of pipeline and canal conveyance using existing rights-of-way (108 miles of new construction and 83 miles of the existing San Luis Drain)
- Canals and low-head pipelines in agricultural and sparsely populated areas
- Pipelines in urban and rapid growth areas
- Estimated total present worth cost of \$1.006 billion (2002 dollars), with an annual equivalent cost of \$62.7 million



**Delta-Carquinez Strait disposal**

- 27,200 acres of regional reuse facilities
- 160 acres of selenium treatment facilities
- Utilizes existing San Luis Drain
- 208 miles of pipeline and canal conveyance using existing rights-of-way (125 miles of new construction and 83 miles of the existing San Luis Drain)
- Canals and low-head pipelines in agricultural and sparsely populated areas
- Pipelines in urban and rapid growth areas
- Estimated total present worth cost of \$1.079 billion (2002 dollars), with an annual equivalent cost of \$67.2 million

**No Action**

- Part of the Grassland Drainage Area's planned In-Valley Treatment/Drainage Reuse Facility would be included in the No Action Alternative. The constructed and funded components include 4,000 acres of land for planting with salt-tolerant crops
- Land retirement of 78,406 acres
- The San Luis Drain would not be used to convey drainage except for the northern area of the Unit as part of the Grassland Drainage Area
- No additional irrigated acres would be brought on line
- No new managed wildlife areas developed within the study area
- No changes to land fallowing patterns

**DISCUSSION**

The Service provides the following discussion associated with our authority as Cooperating Agency for the San Luis Drainage Feature Re-Evaluation Plan and in association with our other authorities, including the Fish and Wildlife Coordination Act, Endangered Species Act (ESA), Clean Water Act, Migratory Bird Treat Act, Central Valley Project Improvement Act (CVPIA), programs like the CALFED Bay/Delta Program (CALFED), and participation in planning efforts like that associated with the San Joaquin Valley Drainage Plan (SJVDP). We focus our comments in four areas: (1) Purpose and Need; (2) No Action Alternative; (3) Action Alternatives; (4) selection of a Preferred Alternative, including extent and accuracy of analyses; and (5) Ecological Monitoring and Mitigation. Our efforts as a Cooperating Agency are to help Reclamation meet NEPA guidance, "...to insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken...."(40 CFR Part 1500.1(b)).

**Purpose and Need**

We believe the project purpose and need should not unnecessarily restrict the evaluation of options to eliminate drainage need. Inclusion of drainage elimination options, like land retirement, would provide for an essential comparison with options that focus more on providing drainage service. We believe consideration of this broader range of drainage management options is more in line with the intent of the National Environmental Policy Act (NEPA) and would provide the decision maker a more complete range of alternatives to evaluate. We believe the court directive, provides for analyzes of a broader range of drainage options. It states "San Luis Act limits the drainage solution to an interceptor drain to the Contra Costa Delta, subsequent Congressional action indicates that the Department of the Interior can meet its drainage obligation through means other than the interceptor drain"(emphasis added). Furthermore, Congressional action has "given the Department the authority to pursue alternative

options other than the interceptor drain to satisfy its duty under the San Luis Act." (Court Decision, Firebaugh Canal v. USA 951664, Case # 95-15300)(emphasis added).

We believe Reclamation should modify the existing Purpose and Need for the San Luis Drainage Feature Re-Evaluation Plan to include all reasonable alternatives to solve drainage problems in the San Luis Unit of the CVP, emphasize avoidance of adverse environmental effects, and recognize and align with other directives and mandates, including the CVPIA, CALFED, SJVDP, ESA, Migratory Bird Treaty Act, and Clean Water Act.

The *Draft Work Plan* includes the following goal: "The desired solution will not only provide an appropriate level of drainage service to the San Luis Unit, but also will avoid impacting the social or ecological environment" (emphasis added). We note this statement is not included in subsequent reports or documents. To ensure that environmental criteria are given proper emphasis and a reasonable range of alternatives are provided to meet the purpose and need, we believe this goal should be inserted and emphasized in all future documents, including the upcoming Environmental Impact Statement (EIS).

### **No Action Alternative**

Integrated On-Farm Drainage Management (IFDM) and SB 1372: Under Reclamation's No Action alternative it is assumed that there will be no development of IFDM systems beyond those already in existence. In light of the recent passage of state Senate Bill 1372 (SB 1372) which relaxes a major regulatory barrier (partial exemption to hazardous waste laws) for expansion of IFDM systems, and in light of the favorable cost/benefit ratio reported for systems in use, the Service believes it is highly unrealistic to assume no further development of IFDM systems under a No Action alternative. The Service further suggests that when a more accurate cost accounting of Reclamation's drainage service alternatives is provided, farmers might opt for on-farm IFDM rather than being connected to Reclamation's drainage collection system.

Study area water supply estimates: Rather than fully excluding water purchases from outside the study area when calculating estimates of water supply to the study area, it may be more realistic and accurate for Reclamation to include such purchases at the average historic level for the last decade or more.

### **Action Alternatives**

As identified in above purpose and need discussions, we believe the current range of alternatives is inadequate to address our understanding of the project purpose and need. Additionally, we believe selection of any of the existing alternatives would not meet our understanding of the directive of NEPA to "...take actions that protect, restore, and enhance the environment" (40 CFR Part 1500.1(c)). Because NEPA provides for lead agencies to, "[I]nclude reasonable alternatives not within the jurisdiction of the lead agency" (1502.14(e)), we also believe NEPA would require a reasonable range of alternatives so as to bracket any perceived court directed action(s).

The Service strongly believes alternatives incorporating a substantial land retirement component would meet the project purpose as defined by court order. Further, the Service believes such alternatives are consistent with the project purpose, applicable court rulings, the San Luis Act,

the CVPIA<sup>1</sup>, goals of CALFED, and may prove to be more environmentally and economically superior than alternatives considered in the *Plan Formulation Report*. We believe focusing on land retirement would reduce or remove drainage service need, and water supply and its management could be increased, possibly helping to meet unmet fish and wildlife needs. Conceptually, about two thirds of San Luis Unit agricultural lands with contract water supplies should be included in this analysis.

The Service is encouraged to see a land retirement evaluation included in Appendix B of the *Plan Formulation Report*. However, land retirement is not a component of drainwater reduction nor otherwise a feature of any action alternatives<sup>2</sup> considered. We note the *Plan Formulation Report* makes no assumptions regarding the disposition of, and possible revenue generated from, water freed up by retiring or fallowing drainage-impaired lands.

The draft EIS for the San Luis Drainage Feature Re-Evaluation Project should include a full cost/benefit analysis of all alternatives, including land retirement. This cost/benefit analysis should account for any possible changes in repayment of CVP costs, including CVPIA Restoration Fund payments, and in the possible future need for Federal agricultural subsidies to the San Luis Unit Planning Area.

The Service notes that Westlands has developed a proposal that would retire a significant amount of land in the district. Westlands issued a report in the fall of 2002 titled, *Why Land Retirement Makes Sense for Westlands Water District*. The report states that the most cost effective means of providing drainage service in Westlands would be land retirement. Westlands' proposal includes retirement of 200,000 acres of land in the district with certainty for delivery of 70 percent of Westlands' current CVP contract water supply during normal and above normal years (805,000 acre-feet per year). If both elements were met, Westlands has stated it would release the government from its obligation to provide drainage service. Given climatic conditions and demands on all CVP and State water supplies, its unknown if a 70 percent water supply commitment is attainable. We would be concerned that with this additional certainty, additional lands could be irrigated in and around Westlands, possibly adversely affecting drainage quality and quantity, impacting fish and wildlife resources, including possible habitat for endangered species, and may compromise CALFED efforts to improve and restore the Bay/Delta environment. It is unlikely that retiring 200,000 acres of irrigated lands in Westlands would completely resolve the drainage problems in the San Luis Drainage Planning Area. For that reason, full environmental analysis of a range of several land retirement scenarios should be evaluated in the EIS. If Reclamation chooses to include evaluation of the land retirement proposal from Westlands in the EIS, then the effects of the increased certainty and associated delivery of up to 805,000 acre-feet/year on CVP-wide operations should be included.

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<sup>1</sup> The CVPIA directs the Department to provide "substantial deference" to the SJVDP recommendations (Section 3405(e)(3) - Water Conservation Standards).

<sup>2</sup> 10,006 acres of permanently retired lands associated with the Britz Settlement Agreement were included in the No Action Alternative.

The *Plan Formulation Report* does not address explicitly whether alternatives that utilize the existing San Luis Drain would have to include removal of existing sediments. Costs and how it would be done in an environmentally acceptable manner should be addressed.

To reduce environmental impacts, the Service believes Reclamation should maximize use and analysis of concepts found in alternatives that have already been removed from consideration, including those focusing on optimization of drainage reduction such as improved irrigation efficiency, periodical land fallowing, and land retirement from willing sellers.

### **Selection of a Preferred Alternative**

The current drainage investigation effort does not appear to be consistent with past drainage efforts, nor does it appear to be compatible with other on-going state-wide efforts to protect, enhance, and restore healthy ecosystems in California. We believe efforts to improve aquatic, terrestrial, and marine environments which we currently participate in would be compromised, to varying degrees, by each of the presented alternatives. Furthermore, it is our view that no current alternative provides equal consideration of fish and wildlife resources with other project purposes, nor meets the project goal to avoid adverse social and/or environmental effects.

Three of the alternatives, in-valley disposal, Delta-Chippis Island disposal, and Delta-Caquinez Strait disposal simply expand drainwater management actions that have already been documented to cause significant environmental impacts. The third alternative, discharge into the ocean, is an untested method with many unknowns. Terrestrial, marine, and/or freshwater aquatic habitats, including the Bay/Delta ecosystem, could be significantly affected, directly or indirectly, by implementing any of the alternatives. The *Plan Formulation Report* provides a feasibility level analysis on potential direct adverse biological effects of implementing project components. Potential indirect effects, like the possible bioaccumulation of selenium in the Bay/Delta, are largely left unaddressed.

In-Valley Disposal Alternative: We believe the attractive nuisance and hazards of evaporation ponds to wildlife, as would be created by this alternative, have been well documented by the Service and others. However, the combination of large scale and the highly concentrated nature of the discharge into these proposed evaporation ponds would be unprecedented. Our experience is that once implemented, these negative effects cannot be entirely reversed. The Service mitigation and compensation protocols, a key mitigation feature in the *Plan Formulation Report*, may not directly apply to these ponds for several reasons discussed below in the Monitoring and Mitigation section. Biological monitoring, with contingency plans to cease discharges if unacceptable adverse effects are encountered, must be included as an adverse effect avoidance measure.

As described in the *Plan Formulation Report*, reuse facilities would be managed to allow contaminated groundwater to rise within 4 feet of the surface as a drainwater storage tool. Groundwater at this level can reach the surface through evaporation processes and bring with it high levels of salt and selenium. Concentrations of selenium in this groundwater are expected to reach 600 ppb and have the potential to exceed 1,000 ppb (the State hazardous waste level). Any water pooling on the surface for longer than a few days (as documented at Red Rock Ranch by California Department of Water Resources biologists) could provide contaminated food items to numerous species of birds. Storm events of sufficient size can potentially transport selenium-

contaminated water to sensitive water supply channels and wetlands. Reclamation's pilot land retirement program has explicitly recognized the ecological risks associated with allowing seleniferous shallow groundwater to rise closer than 7 feet from the ground surface, yet the *San Luis Plan Formulation Report* did not identify such risks, promoted raising water tables to well within capillary-evaporative-wicking distance from the land surface, and did not propose a monitoring plan to document potential environmental effects.

Delta Disposal Alternative: The United States Geological Survey's (USGS) *Forecasting Selenium Discharges to the San Francisco Bay-Delta Estuary: Ecological Effects of a Proposed San Luis Drain Extension* identified that selenium concentrations as low as 1 ppb in water can result in adverse environmental effects (Luoma & Presser 2000). The USGS report notes that selenium bioaccumulation is much higher in the primary production organisms of the estuary than previously encountered elsewhere. Thus, the risk of adverse exposure to selenium would be magnified in high productivity areas in the Bay-Delta. The 5 ppb selenium target at the edge of a mixing zone for the Delta drainwater disposal option, as proposed in the Alternatives Report, is not relevant to the environmental impacts of selenium. This is because mixing zones are primarily intended to address acute toxicity and their use is inappropriate for bioaccumulative substances like selenium. The total load of selenium discharged into the system is a relevant discussion point not included in the *Plan Formulation Report*. Further, the EIS should acknowledge and evaluate potential implications of reasonably foreseeable additions or changes to water quality standards such as the reexamination of the selenium aquatic life criteria. Biological monitoring, with contingency plans to cease discharges if unacceptable adverse effects are encountered, must be included as an adverse effect avoidance measure.

To further substantiate our concerns, new research results from USGS and other studies indicates that selenium in the Delta is entering the food chain at levels that are likely to impact bottom-feeding and predatory organisms (Luoma & Presser 2000). In addition, the State Water Resources Control Board (SWRCB) in their 303(d) list of impaired water bodies of the State (approved February 4, 2003), has identified sources of selenium contamination in Suisun Bay including agricultural drainage and refinery effluent. In evaluating drainage options, Reclamation should consider the cumulative effects of disposal of additional selenium and other constituents in downstream habitats, including the Delta.

Ocean Disposal Alternative: The ocean disposal alternative describes the size of a mixing zone where a 15 ppb selenium target will be met at the edge of the zone. As with the Delta Disposal Alternative, a selenium target at the edge of a mixing zone is not relevant to the environmental impacts of selenium. This is because mixing zones are primarily intended to address acute toxicity and their use is inappropriate for bioaccumulative substances like selenium. The total load of selenium discharged into the system is a relevant discussion point not included in the *Plan Formulation Report*. We currently do not have information regarding marine environmental effects from a short- or long-term selenium plume exposure to marine plants or animals. The area of influence is certainly larger than the projected mixing zone size where 15 ppb selenium will be met at the edge of the zone. Biological monitoring, with contingency plans to cease discharges if unacceptable adverse effects are encountered, must be included as an adverse effect avoidance measure.

Applicable Selenium Standards and Criteria: For all the ocean and Delta disposal alternatives the applicable state and Federal numeric water quality criteria cited by Reclamation (15 and 5 ug/L

selenium) are unlikely to be the most restrictive criteria. The most restrictive criterion will be the narrative criterion that prohibits discharge of any substance in "toxic amounts", regardless of whether numeric criteria are being met. Reports released by USGS and the San Francisco Regional Water Quality Control Board have clearly indicated that within the San Francisco Bay/Estuary even 0.1 to 0.3 ug/L selenium in the water column is associated with bioaccumulation of selenium in bivalve, waterfowl, and fish tissues at levels exceeding widely accepted toxicity guidelines.

Ecotoxicological value of biological treatment: The *Plan Formulation Report* assumes that biological treatment of effluent from the reuse facilities would reduce the selenium content of the drainage water by 80 percent and thereby the ecotoxicity of the water by a comparable degree. However, *Amweg et al.* (2003) recently reported in detail that selenium removal based on biological processes will result in the production of selenoproteins that result in treatment effluent water being more toxicologically harmful than the untreated influent. Reuse drainwater flowing into the algae-bacterial treatment system is estimated to have around 392 ppb selenate while the treatment system will discharge around 48 ppb selenate and 28 ppb selenite and organoselenium. However, our analysis of *Amweg et al.* (2003) data along with bioaccumulation factors calculated from Tulare Basin evaporation ponds shows that the treatment water discharged into evaporation ponds would be the toxic equivalent of 1,400 to 3,000 ppb selenate (**Attachment B**). Thus, it is possible that money allocated to treatment in Reclamation's various alternatives would actually worsen the environmental performance of the project, not improve it. Should this prove to be the case for the particular biological treatment favored by Reclamation, it will have an enormous effect on the amount of mitigation required for evaporation ponds (possibly raising mitigation requirements by an order of magnitude or more). The *Plan Formulation Report* was silent on this issue. We recommend full analysis of issues raised in *Amweg et al.* (2003) be included in the EIS for this project. If biological treatment would have to be abandoned, then size of evaporation ponds and mitigation requirements would need to be re-evaluated along with the costs for mitigation (both of which would increase enormously).

Endangered Species: The Endangered Species Act (ESA) requires the Service to use its authority in furtherance of the purposes of this Act. In acknowledgment and support of that approach, we remind you to complete consultation under section 7 of the ESA prior to finalizing a selected alternative to implement actions to provide drainwater service and disposal. Consultation under section 7 is required for all Federal actions (including planning actions) that may result in effects on federally listed species or their designated critical habitat.

Cost Evaluations for Selection of a Preferred Alternative: The *Draft Alternatives Report*, Table 3.3-3, page 3-45, provides an annual cost range of \$213 to \$306 per acre per year to provide necessary drainage service to the area. However, it appears this information is missing in the *Plan Formulation Report*. Additionally, it is our understanding CVP water users in the drainage problem area currently pay from \$1.00 to \$1.50 per acre per year for drainage service. If water users are to repay this additional cost for drainage, would this cost exceed a reasonable range for continued agriculture in the area? How might any forthcoming ability-to-pay issue be addressed in the EIS and how might it affect fish and wildlife resources (i.e., collection and dispersal of Restoration Funds as provided for under the CVPIA)?

The *Plan Formulation Report* states the costs for land retirement scenarios (ranging from 40,000 to 200,000 acres), including a range of drainage service for areas needing salt removal, exceeds



the cost of meeting drainage needs completely through drainage service. We note, however, Appendix B of the *Plan Formulation Report* makes no assumptions regarding the possible uses (agricultural, municipal, industrial or environmental), revenues and benefits of water made available through the retirement of drainage-impaired lands. Additionally, the complete future cost of maintaining drainwater facilities should be included in all cost comparisons. We believe Reclamation should include this information in future documents to better assess and compare alternatives costs, with special emphasis on land retirement.

The plan formulation process excludes drainage service methodology exceeding \$400 per acre foot of drainage served. Because land retirement and land fallowing costs were estimated to be higher than this limit, it was excluded as a means to reduce drainage volume. We believe the decision to exclude land retirement and land fallowing as options to control the need for drainage service is based on incomplete information. While the *Plan Formulation Report* focuses on losses in crop value associated with fallowed lands, it does not seem to take into account the offsetting values associated with application of the water made available through land retirement/fallowing for beneficial uses elsewhere. Additionally, we note implementation of reverse osmosis treatment, included in the potential action, would likely cost more than the \$400 limit per acre foot. Accordingly, we would like an equal level of consideration for land retirement/fallowing actions, as we believe them to be more sustainable and environmentally preferred.

We believe additional information should be considered in the evaluation, comparison and justification of alternative elements. Cost estimates for the in-valley disposal alternative do not appear to include the necessary long-term costs and commitment for evaporation pond management, evaporation pond and reuse facility monitoring, mitigation, or the cost of their eventual closure.

We believe alternative cost estimates and assumptions in the *Plan Formulation Report* are unclear and insufficiently documented. The *Plan Formulation Report's* cost analysis, Section 5, is cumbersome and confusing, and should be rewritten for the average reader. Currently, we feel the cost analysis does not clearly indicate the actual cost per alternative or identify who should pay for its implementation, and appears incomplete, resulting in totals much lower than expected. Additionally, a full disclosure of all cost assumptions should be presented in the draft EIS for this planning effort.

We believe Reclamation should include an extensive and complete cost/benefit analysis for each alternative in the EIS, especially for alternatives hosting demand and supply management options like land retirement. These analyses should include impacts and benefits to the environment, Trinity River diversions and costs, mitigation costs, monitoring costs, and collection and allocation of any revenues from re-management of CVP water made available through land retirement.

False Precision of Cost Criterion: The estimated costs of the alternatives put forth in the *Plan Formulation Report* vary from approximately \$0.95 to \$1.2 billion. Yet, the cost uncertainties cited throughout the report are large. Reclamation explicitly states that the cost estimates for each complete alternative carry a level of uncertainty that needs to be accounted for and places that level of uncertainty at about +/- 30 percent (USBR 2002:C-1). Consequently, all the alternatives must be viewed as essentially indistinguishable on the basis of cost. The Service

believes that a land retirement alternative might prove to be the superior choice from all other alternatives on the basis of cost, and certainly would be the clearly superior environmental alternative.

Reuse Facility Management: The proposed drainage reuse facilities essentially amount to the farming of salt-tolerant plants. As the Grasslands Bypass Project demonstrates, farmers and districts are fully capable of implementing and operating regional reuse facilities such as the existing facility in the Panoche Drainage District. Allowing non-Federal management of these areas would greatly reduce the cost of construction, operation (in perpetuity), and maintenance (in perpetuity) of such facilities.

### **Ecological Monitoring and Mitigation**

We believe all alternatives put forward in the *Plan Formulation Report* would require extensive ecological monitoring programs on approximately the same scale as that necessary for the Kesterson Program, Grassland Bypass Project, and the CVPIA Land Retirement Demonstration Program. However, we note there is no indication the costs of ecological monitoring have been recognized or incorporated in the O&M cost estimates for each alternative at this time.

Ocean and Delta disposal alternatives will require ecological monitoring of receiving waters. Reclamation acknowledges that toxic effects could be caused by proposed Delta discharges (USBR 2002:6-20). We believe monitoring programs to document the presence or absence of potential toxic effects must be formulated, cost estimates included in planning processes, and then presented for agency and public review. Additionally, a mitigation contingency plan should be formulated with estimated costs to anticipate the possible detection of toxic effects. A plan for monitoring mitigation performance would need to be developed should mitigation be necessary. Finally, ocean and Delta disposal alternatives would likely require extensive environmental sampling and research prior to obtaining a discharge permit, yet there is no itemized indication in the *Plan Formulation Report* that such costs have been included in the cost estimates for these alternatives (they should be broken out separately for public review).

The in-valley alternative will require long-term ecological monitoring of the evaporation ponds and the mitigation sites. While Reclamation briefly acknowledges these needs (USBR 2002: 5-31, 6-21, 6-22), there has been no indication that any monitoring plans have been formulated or costs estimated to date. Thus, monitoring costs appear to be absent from cost estimates for this alternative. Specific monitoring plans should be formulated, costs estimated, and the results presented for agency and public review. Because of the large size of the proposed evaporation ponds, monitoring plans must anticipate the potential for local (on-site) as well as landscape scale effects and must address a full spectrum of chemical toxicity (more than just selenium, e.g. boron), epizootic risks (e.g., botulism), physical risks (salt encrustation of waterbirds), and operational risks (incidental to pond operation and maintenance activities). Also, monitoring plans must anticipate risks to on-site resident breeding birds, wintering birds, and spring/fall migrant populations.

For all the proposed alternatives, we believe ecological monitoring will be required for the extensive acreages of drainage reuse facilities. The *Plan Formulation Report* fails to acknowledge this need. Again, costs for this monitoring, along with potential mitigation and mitigation performance monitoring, do not appear to have been estimated or included in cost



estimates. Monitoring for reuse areas will have to anticipate potential risk pathways from both the application of reuse drainage water and the shallow groundwater storage of drainage at less than 7 feet below ground surface. Again, the large size of the reuse facilities means that monitoring will have to anticipate the potential for both local (on-site) as well as landscape scale effects. The monitoring plan will also have to anticipate contingencies for adaptively responding to episodic events (such as severe individual storms or severe "El Nino" seasons) that could result in ephemeral surface pooling of water over large areas of the reuse sites (as has been documented for individual storms at Red Rock Ranch and severe "El Nino" seasons at Kesterson Reservoir). The monitoring plan will have to accommodate the qualitatively different needs for both terrestrial and aquatic ecosystem monitoring and potential mitigation. Reclamation should also explicitly state what the anticipated monitoring needs (if any) might be for the equalization basins at the treatment facilities. Unlike the anoxic ponds, it was not stated whether the equalization basins would be covered. The formulated monitoring plans, mitigation contingencies, and cost estimates should be presented for agency and public review.

The environmental effects of San Joaquin Valley drainwater disposal are thoroughly documented in many publications. Included in a long list of reports is *Effects of irrigation drainwater contaminants on wildlife* (Moore et. al. 1990). Any San Luis Unit drainwater or salt disposal action(s) would require substantial environmental mitigation and biological monitoring investments.

We believe the *Mitigation Requirements Related to Evaporation Ponds in the San Joaquin Valley of California, Draft White Paper*, July, 2002 and the *Draft Alternatives Report* do not provide sufficient information to make an informed decision on the use of evaporation ponds for drainage water reduction. On February 25, 2002, the Service provided an evaporation pond analysis, *San Luis Unit Drainage Re-evaluation - Evaporation Ponds*, which included mitigation, monitoring, and cost information that should be included in a revised "White Paper" and the EIS. Our evaporation pond summary identified costs could be in the billions of dollars over a 50-year project life expectancy. The *Plan Formulation Report* does not include these likely costs. The financial commitment of evaporation pond management, mitigation, and monitoring should be fully disclosed in the EIS for this planning effort.

For a complete evaluation of any of the alternatives, we believe Reclamation should convene a mitigation and monitoring workshop with the Service, the San Francisco Bay and Central Valley Regional Water Quality Control Boards, and other interested parties with appropriate technical expertise as soon as possible. We believe without such a workshop (ideally including fully updated mitigation protocols) cost estimates for any alternative would be speculative, and for the reasons stated above, almost certainly and substantively are underestimated.

## SUMMARY

The Service believes Reclamation's current purpose and need for the San Luis Drainage Feature Re-Evaluation Plan, as a result of their interpretation of the District Court's order, unnecessarily confines the scope of alternatives to drainage service options. We believe any suite of alternatives designed to address San Luis Drain drainage issues must include options which would seek to eliminate the need for drainage service. As such, we recommend including a full range of water demand and supply management options, like improved irrigation efficiency and land retirement and fallowing, in your San Luis Drainage Feature Re-Evaluation solution.

We believe Reclamation, in its efforts to solve San Luis Drain drainage issues, should fully consider and include mandates and directives as provided under the Central Valley Project Improvement Act, the CALFED Bay/Delta Program, the Endangered Species Act, the Clean Water Act, and the Migratory Bird Treaty Act. By focusing on long-term, sustainable ecosystem values, we believe Reclamation would be better able to balance water supply with demand, provide for truly sustainable agriculture and improved water quality, while increasing the quantity and quality of San Joaquin Valley habitat, possibly providing for the recovery of numerous listed species, and the protection of millions of migratory birds.

#### Attachments

cc:

AES, Portland, OR

California/Nevada Office, Fish and Wildlife Service, Sacramento, CA

Bureau of Reclamation, Fresno, CA (Attn: William Luce, Area Manager)

Bureau of Reclamation, Sacramento, CA (Attn: Alan Candlish, Division of Planning)

Bureau of Reclamation, Sacramento, CA (Attn: Jason Phillips, Division of Planning)

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ATTACHMENT A

FEATURE RE-EVALUATION

## United States Department of the Interior

### FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office  
2800 Cottage Way, Room W-2605  
Sacramento, California 95825-1846

IN REPLY REFER TO:

December 5, 2002

### Memorandum

**To:** Regional Director, U.S. Bureau of Reclamation, Division of Planning,  
Sacramento, California (Attn: Jason Phillips)

**From:** Acting Field Supervisor, Sacramento Fish and Wildlife Office,  
Sacramento, California

**Subject:** Cooperating Agency acceptance for the San Luis Drainage Feature Re-evaluation  
and Environmental Impact Statement Project

Thank you for your November 4, 2002, invitation to participate as a cooperating agency on the San Luis Drainage Feature Re-evaluation project. The Fish and Wildlife Service will participate in this effort as a cooperating agency, as defined under the National Environmental Policy Act. We request a meeting to discuss the level of our participation, responsibility, and contribution soon. Subsequent this meeting, we should develop a Memorandum of Agreement describing the expected activities and deliverables for each agency.

If you have questions, please contact Mr. Mark Littlefield at 916-414-6581.

*David L. Harlow*



U.S. Department of Transportation  
Environmental Stewardship and Transportation Infrastructure Project Reviews  
Home > Connaughton Letter

EXECUTIVE OFFICE OF THE PRESIDENT  
COUNCIL ON ENVIRONMENTAL QUALITY  
WASHINGTON, D.C. 20503

CHAIRMAN

May 12, 2003

The Honorable Norman Y. Mineta  
Secretary, Department of Transportation  
400 Seventh St., S.W., Room 10200  
Washington, D.C. 20590

Dear Secretary Mineta:

I write in response to your letter of May 6, 2003, asking for the Council on Environmental Quality's (CEQ) guidance on the issue of "purpose and need" in the context of compliance with CEQ's regulations implementing the procedural provisions of NEPA. Your letter refers to the fact that the Interagency Transportation Infrastructure Streamlining Task Force has identified "purpose and need" as a priority issue in need of clarification. Specifically, you ask for guidance on the appropriate exercise of authority by lead and cooperating agencies in determining the purpose and need.

The requirement for a discussion of "purpose and need" in an environmental impact statement under the CEQ regulations is to "briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." 40 C.F.R. §1502.13. This discussion, typically one or two paragraphs long, is important for general context and understanding as well as to provide the framework in which "reasonable alternatives" to the proposed action will be identified.

The lead agency -- the federal agency proposing to take an action -- has the authority for and responsibility to define the "purpose and need" for purposes of NEPA analysis. This is consistent with the lead agency's responsibilities throughout the NEPA process for the "scope, objectivity, and content of the entire statement or of any other responsibility" under NEPA. 42 U.S.C. §4332(D); see also, 40 C.F.R. §§1501.5, 1506.5.

Federal courts generally have been deferential in their review of a lead agency's "purpose and need" statements, absent a finding that an agency acted in an arbitrary or capricious manner. They have recognized that federal agencies should respect the role of local and state authorities in the transportation planning process and appropriately reflect the results of that process in the federal agency's NEPA analysis of purpose and need. *North Buckhead Civic Assoc. v. Skinner*, 903 F.2d 1533 (11th Cir. 1990). Courts have cautioned agencies not to put forward a purpose and need statement that is so narrow as to "define competing 'reasonable alternatives' out of consideration (and even out of existence)", *Simmons v. U.S Army Corps of Engineers*, 120 F.3d 664 (7th Cir. 1997); (see also, *Alaska Wilderness Recreation and*

*Tourism Association v. Morrison*, 67 F.3d 723 (9th Cir. 1995).

In situations involving two or more agencies that have a decision to make for the same proposed action and responsibility to comply with NEPA or a similar statute, it is prudent to jointly develop a purpose and need statement that can be utilized by both agencies. An agreed-upon purpose and need statement at this stage can prevent problems later that may delay completion of the NEPA process. As Congress stated in the Federal Aid Highway Act of 1973, "It is the national policy that to the maximum extent possible the procedures to be utilized by the Secretary and all other affected heads of Federal departments, agencies, and instrumentalities for carrying out this title and any other provision of law relating to the Federal highway programs shall encourage the substantial minimization of paperwork and interagency decision procedures and the best use of available manpower and funds so as to prevent needless duplication and unnecessary delays at all levels of government", 23 U.S.C. §101(e); see also, CEQ's regulations implementing NEPA at 40 C.F.R. §§1500.4, 1500.5.

In the case of a proposal intended to address transportation needs, joint lead or cooperating agencies should afford substantial deference to the DOT agency's articulation of purpose and need. 49 U.S.C. §101(b)(5). This deference reflects CEQ's expectation and experience in other settings where an agency has the primary substantive expertise and program responsibility. If a cooperating or joint lead agency identifies substantive or procedural problems with the purpose and need statement, including an omission of factors, important to that agency's independent legal responsibilities, the agency should raise those issues immediately and, if necessary, elevate those issues to higher level decisionmakers in the region and at headquarters for resolution. Thoughtful resolution of the purpose and need statement at the beginning of the process will contribute to a rational environmental review process and save considerable delay and frustration later in the decisionmaking process.

Please let me know if you have any further questions regarding this issue. Thank you for your leadership and I commend your department officials for the work they are undertaking in fulfilling the President's direction.

Sincerely,

[Original signed by]

James L. Connaughton

E-Mail: [ProjectStreamlining@ost.dot.gov](mailto:ProjectStreamlining@ost.dot.gov)

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This page last modified on May 23, 2003



## Comparative bioavailability of selenium to aquatic organisms after biological treatment of agricultural drainage water

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Received 16 January 2002; received in revised form 15 July 2002; accepted 17 July 2002

### Abstract

Selenium (Se) is naturally abundant in the soils of the western San Joaquin Valley, California, USA. Intense agricultural activity in this region requires irrigation which leaches Se into surface waters draining to the San Joaquin River. Se water contamination and subsequent accumulation in wildlife is a serious problem in the Central Valley of California, and the subject of increasingly intensive regulatory action. Algal–bacterial selenium reduction (ABSR) is a potential new treatment approach to reduce Se in agricultural drainage, and an ABSR demonstration facility was examined with respect to its Se removal efficiency and effect on Se bioavailability and bioaccumulation. Water samples were taken to study treatment effects on Se speciation. Invertebrate tissue Se concentrations in the ABSR ponds were monitored for 2 years. Laboratory-based algal bioaccumulation tests and *in situ* microcosms with a variety of invertebrates were also used to address differences in Se bioavailability before and after ABSR treatment. The ABSR system removed about 80% of the total influent Se; however, microbial and algal activity produced selenite and organic Se, the combined concentration of which increased 8-fold during treatment. As a result of the greater bioavailability of selenite and organic Se, relative to the selenate of the influent, treatment contributed to greater Se concentrations in effluent-exposed organisms. ABSR-treated water produced Se concentrations in biota 2–4 times greater than organisms exposed to untreated water. The bioavailability of Se in the treated water was 2–10 times greater than Se in the influent. The shift to more bioavailable Se forms due to biological treatment is inherent in system design, and makes it difficult to weigh the ecological benefits of a reduction in total Se loadings from a regional perspective against the greater toxicological risk to biota in the vicinity of the effluent.

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**Keywords:** Selenium; Bioavailability; Speciation

### 1. Introduction

Selenium (Se) is a semi-metallic element found naturally in high concentrations in the soils of the western San Joaquin Valley, California (Loši and Frankenberger, 1997a). Agricultural activity in

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E-mail address: eamweg@socrates.berkeley.edu (E.L. Amweg).

## **Algal-Bacterial Selenium Reduction (ABSR)**

**Toxic Equivalency Calculations (based on data in Amweg et al. 2003):**

**Start w/ 392 ug/l selenate**

**End up with 48 ug/l selenate and 28 ug/l reduced Se (total Se of 76 ug/l) after ABSR including DAF and SSF.**

### **Bioaccumulation:**

**Worms - start out with 25 ug/g dw; end up with 51.4 ug/g dw Se (ratio of ca. 2X).**

**Snails - start out with 17.3 ug/g dw; end up with 47.1 ug/g dw Se (ratio of ca. 2.7).**



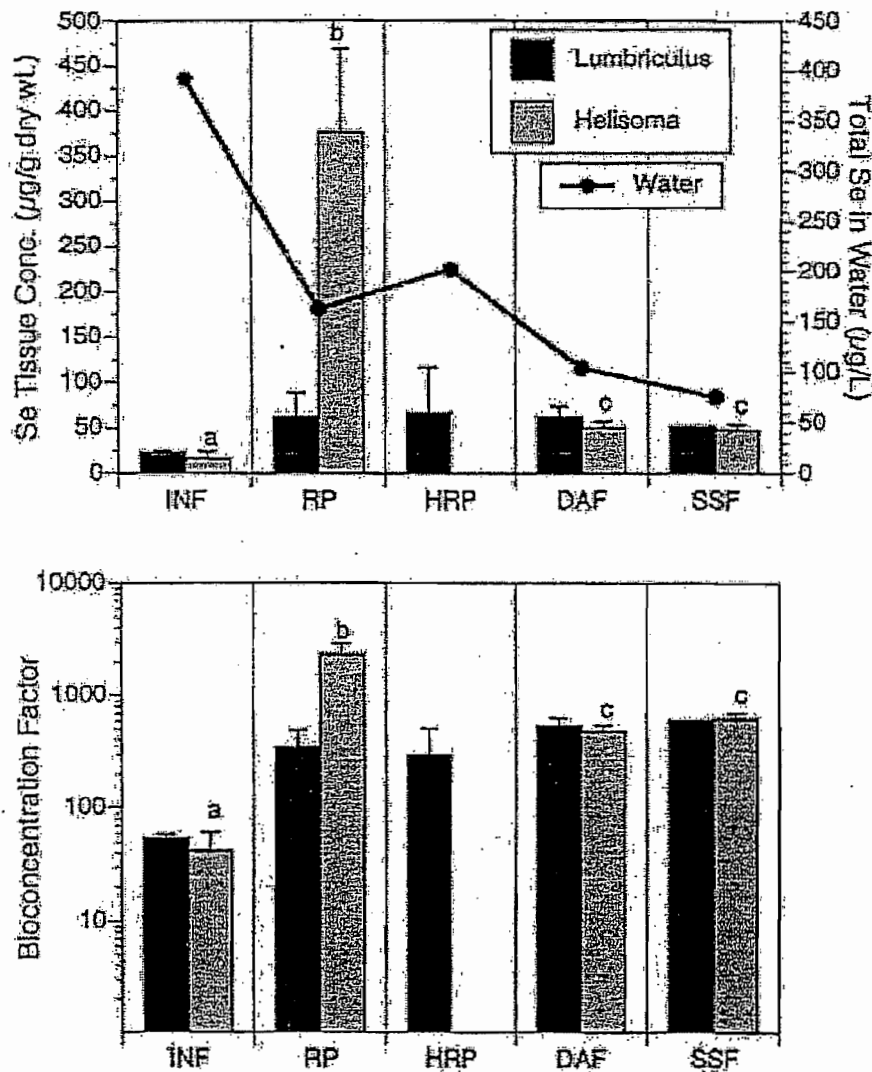
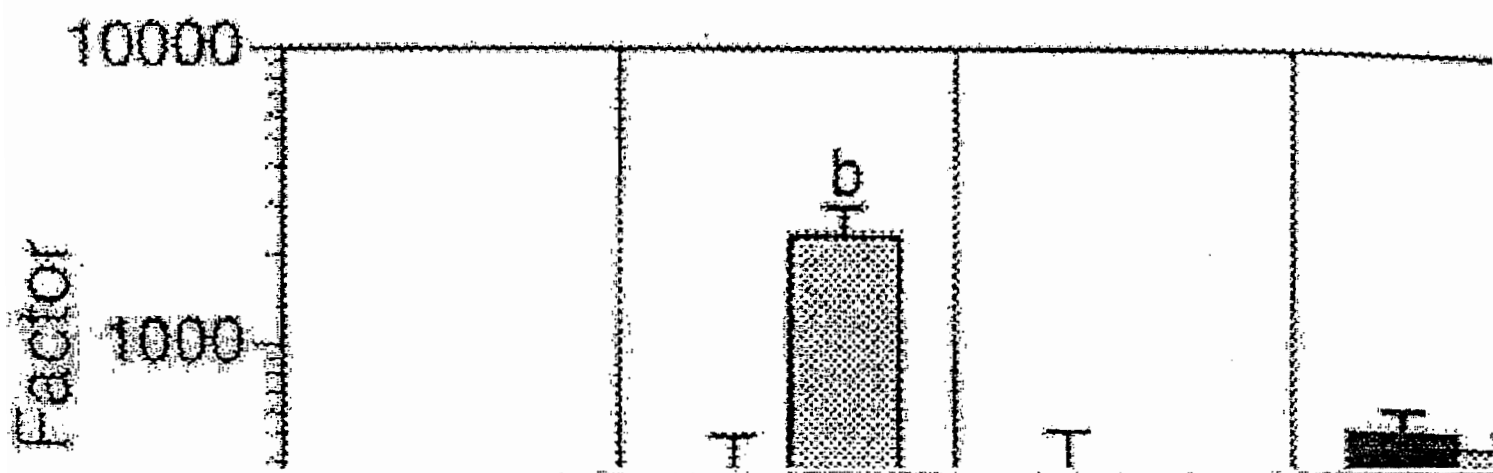
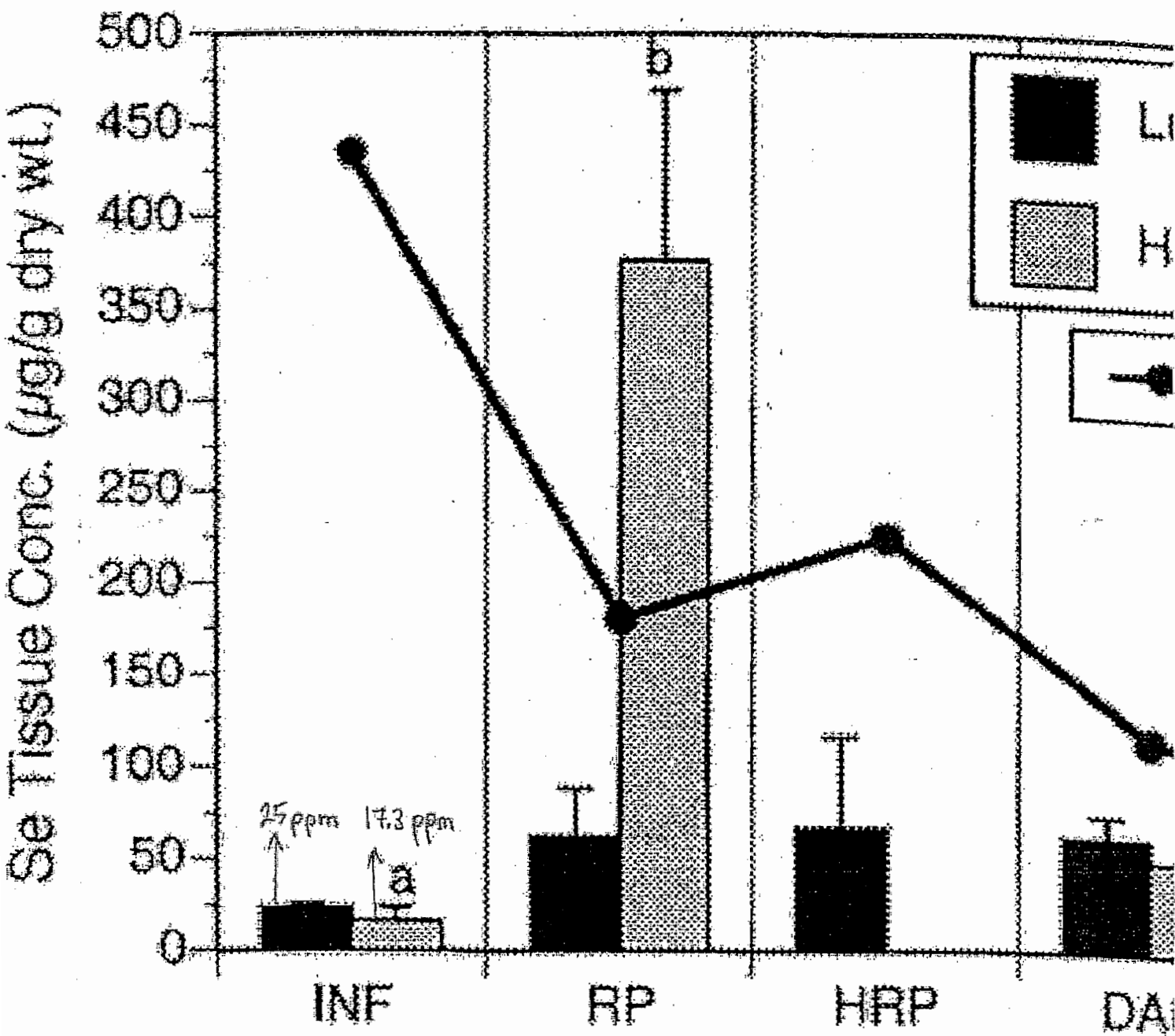


Fig. 7. Total Se concentrations and BCFs in microcosm invertebrates after 30 days in situ exposure to ABSR system water. Means and standard deviations are shown, with  $n$  usually equal to 3. Significant differences among the treatments, based on Conover's multiple comparison test ( $P < 0.05$ ) are designated by letter symbols. Average water Se concentrations at each step in the system throughout the exposure period are shown as a line in the first panel. No *Helisoma* sp. were recovered from the HRP microcosm.

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## APPENDIX 5

COMMON NAME	SCIENTIFIC NAME
<b>Plants</b>	
acacia	<i>Acacia</i> spp.
alkali blite	<i>Suaeda moquini</i>
alkali bulrush	<i>Scirpus maritimus</i>
alkali heliotrope	<i>Hilitropium curassavicum</i>
alkali popcornflower	<i>Plagiobothrys leptocladus</i>
alkali sacaton	<i>Sporobolus airoides</i>
alkali weed	<i>Cressa truxillensis</i> var. <i>vallicola</i>
barley	<i>Hordeum</i> spp.
Bermuda grass	
Blennosperma	<i>Blennosperma nanum</i>
blue elderberry	<i>Sambucus caerulea</i>
Buckwheat	<i>Polygonum</i> spp.
California blackberry	<i>Rubus vitifolius</i>
California sycamore	<i>Plantanus racemosa</i>
casuarina	<i>Casuarina</i> spp.
cattail	<i>Typha latifolia</i>
clover	<i>Trifolium depauperatum</i>
cottonwood	<i>Populis</i> spp
Creeping wild rye	<i>Leymus triticoides</i>
Dock	<i>Rumex</i> spp.
Downingia	<i>Downingia bella</i>
eucalyptus	<i>Eucalyptus</i> spp.
flowering quillwort	<i>Lilaea scilloides</i>
foxtail	<i>Alopecurus howellii</i>
foxtail fescue	<i>Festuca megalura</i>
Goldenbush	<i>Isocoma acradenius</i>
Gum plant	<i>Grindelia camporum</i>
hairgrass	<i>Deschampsia danthonoides</i>
Hardstem bulrush	<i>Scirpus acutus</i>
hedge hyssop	<i>Gratiola ebracteata</i>
Hoary nettle	<i>Urtica dioica</i>
horned pondweed	<i>Zannichellia palustris</i>
iodine bush	<i>Allenrolfea occidentalis</i>
locoweed	<i>Astragalus tener</i>
loosestrife	<i>Lythrum hyssopifolia</i>
Meadowfoam	<i>Limnanthes douglasii</i> var. <i>rosea</i>
mesquite	<i>Prosopsis</i> spp.
Naverretia	<i>Navarretia intertexta</i> ,
oats	<i>Avena fatua</i>

peppergrass	<i>Lepidium latipes</i>
perennial pepperweed	<i>Lepidium latifolium</i>
Pickleweed	<i>Salicornia pacifica</i>
poison hemlock	<i>Conium maculatum</i>
Primrose	<i>Boisduvalia glabella</i> = <i>Epilobium pygmaeum</i>
purple needlegrass	<i>Stipa pulchra</i>
quillwort	<i>Isoetes orcuttii</i>
red brome	<i>Bromus rubens</i>
ripgut brome	<i>Bromus rigidus</i>
Rush	<i>Juncus uncialis</i>
Salt grass	<i>Distichlis spicata</i>
Saltbush	<i>Atriplex</i> spp.
sandwort	<i>Arenaria californica</i>
Smartweed	<i>Polygonum</i> spp.
soft chess	<i>Bromus mollis</i>
spikerush	<i>Eleocharis</i> spp.
swamp timothy	<i>Crypsis schoenoides</i>
Tall fescue	<i>Festuca arundinacea</i>
Tamarisk	<i>Tamarix aphylla</i>
Toad rush	<i>Juncus bufonius</i>
valley oak	<i>Quercus lobata</i>
Watergrass	<i>Echinochloa colonum</i>
white brodiaea	<i>Brodiaea hyacinthina</i>
widgeongrass	<i>Ruppia maritima</i>
wild millet	<i>Setaria</i> spp.
wild rose	<i>Rosa californica</i>
willow	<i>Salix</i> spp.
woolly marbles	<i>Psilocarphus brevissimu</i>
<b>Insects and Invertebrates</b>	
brine flies	<i>Ephydriidae</i> spp.
brine shrimp	<i>Artemia</i> spp.
Midges	<i>Chironomidae</i> spp.
water boatmen	<i>Corixidae</i> spp.
<b>Fish</b>	
American shad	<i>Alosa sapidissima</i>
black bullhead	<i>Ameiurus melas</i>
black crappie	<i>Pomoxis nigromaculatus</i>
Bluegill	<i>Lepomis macrochirus</i>

Carp	<i>Cyprinus carpio</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Fathead minnow	<i>Pimephales promelas</i> ???
Goldfish	<i>Carassius auratus</i>
green sunfish	<i>Lepomis cyanellus</i>
Inland silverside	
largemouth bass	<i>Micropterus salmoides</i>
mosquito fish.	<i>Gambusia affinis</i>
Red shiner	
Sacramento blackfish	<i>Orthodon microlepidotus</i>
Steelhead	<i>Oncorhynchus mykiss</i>
striped bass	<i>Morone saxatilis</i>
Sturgeon	<i>Acipenser spp.</i>
threadfin shad	<i>Dorosoma petenense</i>
white catfish	<i>Ameiurus catus</i>
<b>Birds</b>	
American avocet	<i>Recurvirostra americana</i>
American coot	<i>Fulica americana</i>
American crow	<i>Corvus brachyrhynchos</i>
American kestrel	<i>Falco sparverius</i>
American robin	<i>Turdus migratorius</i>
bald eagle	<i>Haliaeetus leucocephalus</i>
black-bellied plover	<i>Pluvialis squatarola</i>
black-necked stilt	<i>Himantopus mexicanus</i>
white-tailed kite	<i>Elanus caeruleus</i>
blue grosbeak	<i>Guiraca caerulea</i>
blue-winged teal	<i>Anas discors</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>
brown-headed cowbird	<i>Molothrus ater</i>
burrowing owl	<i>Athene cunicularia</i>
cinnamon teal	<i>Anas cyanoptera</i>
Dunlin	<i>Calidris alpina</i>
eared grebe	<i>Podiceps auritus</i>
ferruginous hawk	<i>Buteo regalis</i>
gadwall	<i>Anas strepera</i>
golden eagle	<i>Aquila chrysaetos</i>
great blue heron	<i>Ardea herodias</i>
great horned owl	<i>Bubo virginianus</i>
greater yellowleg	<i>Tringa melanoleuca</i>
house finch	<i>Carpodacus mexicanus</i>
house sparrow	<i>Passer domesticus</i>
Killdeer	<i>Charadrius vociferus</i>
least sandpiper	<i>Calidris minutilla</i>

lesser yellowleg	<i>Tringa flavipes</i>
long-billed dowitcher	<i>Limnodromus scolopaceus</i>
Mallard	<i>Anas platyrhynchos</i>
mourning dove	<i>Zenaida macroura</i>
Northern harrier	<i>Circus cyaneus</i>
Northern pintails	<i>Anas acuta</i>
Northern shovelers	<i>Anas clypeata</i>
peregrine falcon	<i>Falco peregrinus</i>
Redhead	<i>Aythya americana</i>
red-tailed hawk	<i>Buteo jamaicensis</i>
red-winged blackbird	<i>Agelaius phoeniceus</i>
rough-legged hawk	<i>Buteo lagopus</i>
ruddy duck	<i>Oxyura jamaicensis</i>
short-eared owl	<i>Asio flammeus</i>
song sparrow	<i>Melospiza melodia</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Western kingbird	<i>Tyrannus verticalis</i>
Western sandpiper	<i>Calidris mauri</i>
Western snowy plover	<i>Charadrius melodus</i>
white-crowned sparrow	<i>Zonotrichia leucophrys</i>
Wilson's phalarope	<i>Phalaropus tricolor</i>
yellow-rumped warbler	<i>Dendroica coronata</i>
<b>Mammals</b>	
blacktailed jackrabbit	<i>Lepus californicus</i>
brush rabbit	<i>Sylvilagus bachmani</i>
California ground squirrel	<i>Citellus beecheyi</i>
California vole	<i>Microtus californicus</i>
Coyote	<i>Canis latrans</i>
deer mouse	<i>Peromyscus maniculatus</i>
desert cottontail	<i>Sylvilagus auduboni</i>
house mouse	<i>Mus musculus</i>
kangaroo rat	<i>Dipodomys spp.</i>
Longtail weasel	<i>Mustela frenata</i>
Muskrat	<i>Ondatra zibethica</i>
roof rat	<i>Rattus rattus</i>
Raccoon	<i>Procyon lotor</i>
San Joaquin kit fox.	<i>Vulpes macrotis mutica</i>
Southern grasshopper mouse	<i>Onychomys torridus</i>
Western harvest mouse	<i>Reithrodontomys megalotis</i>

<b>Reptiles and Amphibians</b>	
blunt-nosed leopard lizard	<i>Gambelia silus</i>
Bullfrog	<i>Rana catesbeiana</i>
giant garter snake	<i>Thamnophis gigas</i>
gopher snake	<i>Pituophis catenifer</i>
Pacific treefrog	<i>Hyla regilla</i>
side-blotched lizard	<i>Uta stansburiana</i>
Western fence lizard	<i>Sceloporus occidentalis</i>
Western spadefoot toad	<i>Scaphiopus hammondi</i>
Western yellow-bellied racer	<i>Coluber constrictor mormon</i>